Profile of children presenting with Exstrophy Epispadias Complex and Incontinent Epispadias to Christian Medical College, Vellore, between the years 1991 to 2009, their management and follow up – A Descriptive study.

Thesis presentation in partial fulfillment of the requirement for examination to be held in August 2010 by Dr.MGR Medical University for MCh Paediatric Surgery

Abstract

Title: Profile of children presenting with Exstrophy Bladder to Christian Medical Collage, Vellore, between the years 1991 to 2009, their management and follow up – A Descriptive study.

Background: Exstrophy Epispadias complex is a midline abdominal anomaly characterized by defects involving the urinary system, the musculoskeletal system, the pelvis, the pelvic floor, the abdominal wall, the genitalia and sometimes the spine and the anus. Reconstruction involves closure of the defects, various methods of which have been devised over the years. Important factors determining the success of closure are achievement of continence with a good low pressure urinary reservoir for preservation of the upper renal tracts.

Materials and Methods: A total of 102 children with Exstrophy epispadias and incontinent epispadias presenting between 1991 and 2009 were studied. Exstrophy: 50 were fresh cases and 42 operated elsewhere. Incontinent epispadias: 5 were fresh cases and 1 was operated elsewhere. Various methods of primary closure were reviewed. Complications following closure, namely failure of closure, incontinence, upper renal tract changes, altered bladder compliance etc., were listed and their management was reviewed which included bladder neck procedures and Agmentation cystoplasty. Patients were then followed up with regard to above mentioned factors.

Results: Closure was achieved in all the followed up patients**:** Out of 50 New cases, 45 achieved closure following primary closure at first instance. Of the 22 failed closures (17 operated elsewhere + 5 failed among new cases), closure was achieved in all, subsequently, with or without concomitant augmentation. Continence was achieved with primary closure and bladder neck procedure in 18 of the 81 followed up children, bladder augmentation was required in 37. Another 8 advised augmentation. 12 of the 48 with ultrasound follow-up developed hydro-ureteronephrosis which resolved or decreased after augmentation in 8. Vesico-ureteric reflux was seen in 30 (50 refluxing units) of the 31 patients with MCU follow-up. With Augmentation +/- reimplantation, reflux resolved or decreased in 21 of the 28 units further followed up with MCU.

Conclusions: In our scenario of delayed presentation to a tertiary care centre, where the pliability of the bony pelvis, crucial for Exstrophy repair, is lost. Hence, Rectus muscle flap without pubic bone approximation has been developed for successful closure, even in repeatedly failed closures. Continence rate has been low, again for the same reason, with most requiring an augmentation cystoplasty. Those closed successfully need to be followed up for Upper tract changes with Urodynamic study in addition to ultrasound and MCU imaging, since a closed bladder is a potential high pressure system, and needs to be treated if so.

Aim

To evaluate the children with Bladder Exstrophy Epispadias Complex (Ectopia Vesicae) and Incontinent Epispadias, who presented to our hospital between 1991 and 2009, methods of bladder reconstruction and their outcome; including complications and follow up, with regard to continence, bladder capacity and preservation of upper urinary tracts.

Objectives

1. To evaluate the general characteristics of the children presenting with Exstrophy Bladder at presentation, including the anatomical types in fresh cases and the complications seen in already operated cases.

2. To review the operative techniques employed to repair the Exstrophy.

3. To review the operations done to address the complications in operated cases.

4. To evaluate the outcomes of these treatment modalities i.e., symptomatic relief as well as subsequent complications.

5. To follow up the patients with regard to successful closure, continence rates, and upper renal tract status in all these children

Literature Review

Definition

The Exstrophy-epispadias complex is the most serious form of abdominal midline malformation. The characteristic defects involve the urinary system, the musculoskeletal system, the pelvis, the pelvic floor, the abdominal wall, the genitalia and sometimes the spine and the anus [1]. The Exstrophy-epispadias complex covers a spectrum with different severity levels, ranging from epispadias (E) representing the mildest form, with lower and upper fissure, to the full picture of classical bladder exstrophy (CEB), and exstrophy of the cloaca (EC) - often also referred to as OEIS (omphalocele, exstrophy, imperforate anus and spinal defects) complex - as the most severe form. Exstrophy-epispadias complex can be subdivided into "classic" or "typical" forms (epispadias, classical, and Cloacal exstrophy) and "atypical" forms (duplicated exstrophy, covered exstrophy and pseudo-exstrophy).

Epidemiology

Varying data have been reported on the incidence of the Exstrophy-epispadias complex, especially in respect to various subtypes, different ethnic groups and the male-to-female ratio. Altogether, the combined incidence of the EEC spectrum can be estimated at 1 in 10,000 births. A higher occurrence in males compared to females is observed, ranging from a ratio of 1.5:1 to 6.0:1 [2-5]. Associated risk factors like preterm birth, low birth weight, multiple births have been identified.

Disease spectrum of Exstrophy-epispadias complex [6]

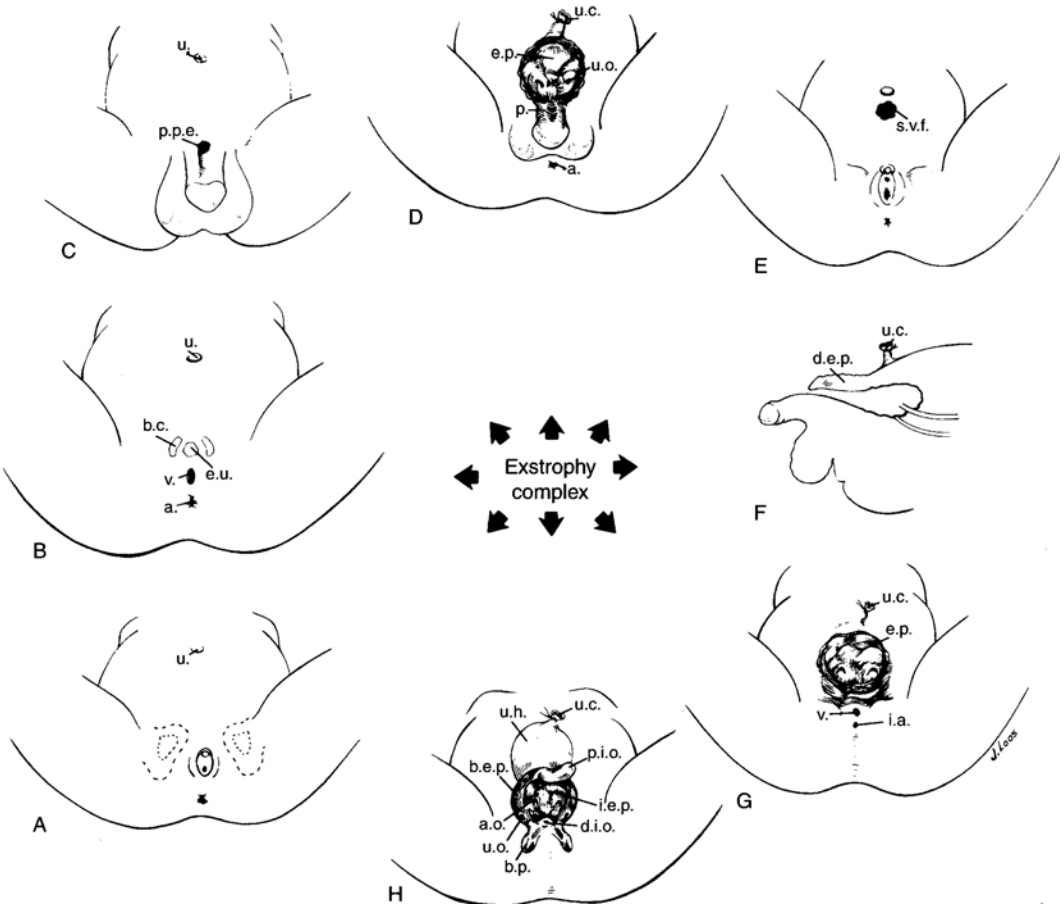


Figure : Disease spectrum of the exstrophy complex. *A*, Diastasis pubis. *B*, Female epispadias. *C*, Male epispadis. *D*, Classic bladder exstrophy. *E*, Superior vesical fistula. *F*, Duplex exstrophy. *G*, Bladder exstrophy with imperforate anus. *H*, Cloacal exstrophy. a., anus; a.o., appendiceal orifice; b.c., bifid clitoris; b.e.p., bladder exstrophic plate; b.p., bifid penis; d.e.p., duplicate exstrophic plate; d.i.o., distal intestinal orifice; e.p., exstrophic plate; e.u., epispadiac urethra; i.a., imperforate anus; i.e.p., intestinal exstrophic plate; p., penis; p.i.o., proximal intestinal orifice p.p.e., penopubic epispadias; s.v.f., superior vesical fistula; u., umbilicus; u.c., umbilical cord; u.h., umbilical hernia; u.o., ureteral orifice; v., vagina.

Clinical description

Classical bladder exstrophy

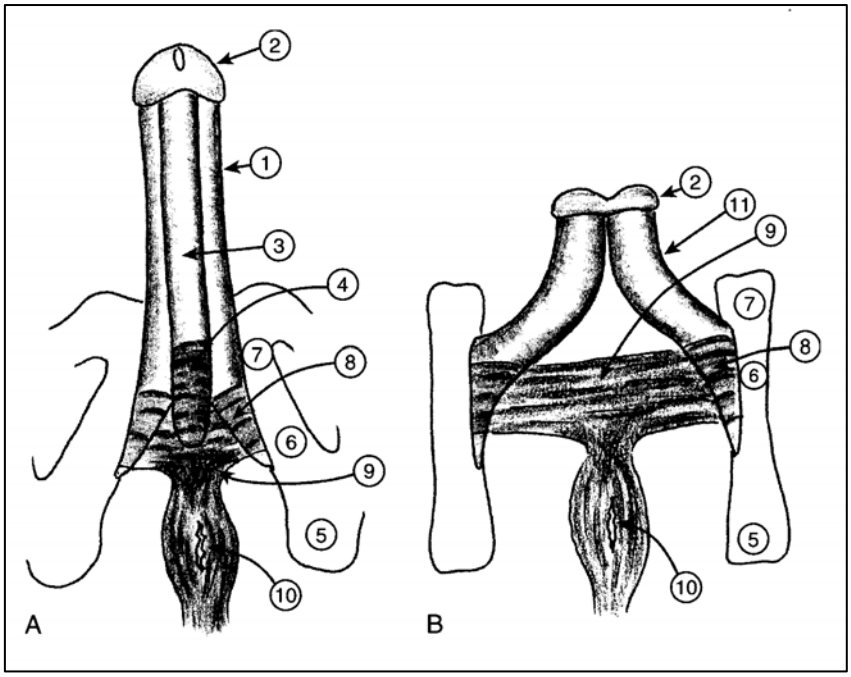
Classical bladder exstrophy is characterized by the evaginated bladder plate of different individual size. Urine is dripping from the ureteric orifices on the bladder surface. The visible bladder mucosa appears reddish at birth and mucosal polyps may be seen on the surface. Delayed closure, however, may lead to further inflammatory or mechanical alterations with signs of mucosal inflammation such as a whitish coating, ulcerations and hyperplastic formations. The paraexstrophic shining thin skin stripes mark the transition junction between the normal skin and squamous

metaplastic area. Below the low situated umbilicus, rectus diastasis and small umbilical hernias can be palpated. At the distal end of the triangular edges, the pubic bones can be felt on both sides of the bladder template. This diastasis causes an outward rotation and eversion of the pubic rami at their junctions with the ischial and iliac bones. Stec et al also noted significant differences in the pelvic floor musculature especially levator ani orientation, based on a review of three-dimensional CT scans. Bilateral inguinal hernias are palpable in most patients of both sexes. These hernias are both direct and indirect because of the large fascial defects extending laterally to the divergent rectii and overlying rectus sheath and inferiorly to the open urogenital diaphragm stretched between the two pubic bones. With bladder exstrophy, the distance between the umbilicus and the anus is foreshortened, making the perineum appear short and wide. The anus is usually situated immediately behind the urogenital diaphragm, anteriorly displaced, corresponding to the

posterior limit of the large triangular fascial defect in the anterior abdominal wall. The anal sphincter mechanism is also displaced anteriorly, and the levator ani are divergent, leading to pelvic floor weakness and rectal prolapse in 10 – 20% of children, further accentuated by abnormal straining. Rectal prolapse typically resolves after bladder closure.

Male genital anatomy in Classical bladder exstrophy

In male newborns, an open (= epispadic) urethral plate covers the whole dorsum of the penis from the open bladder to the glandular grove.



1. Corpus cavernosum of the penis;
2. Glans penis;
3. Corpus spongiosum;
4.Bulbospongiosus muscle;
5.Ischium;
6.Ischiopbic ramus; 7.Pubis;
8. Ischiocavernosus and crus of penis;
9.Urogenital diaphragm;
0. Anus and external anal sphincter

Normal male Exstrophy male

Both corpora cavernosa are located beneath the urethral plate. Careful examination reveals the colliculus seminalis and the ductus ejaculatorii as tiny openings in the area, where the prostate is presumably dorsally located. The penis appears shorter than normal and dorsally curved.

Silver et al found that these children have significantly shorter total and anterior corporal length, showing that phallic shortening is related to both congenital corporal body and skeletal pelvic abnormalities.

In fact, the degree of foreshortening, especially if associated with significant dorsal chordee, may be severe enough that the penis and glans are located adjacent to the veru montanum. The normal-sized testes are usually located in the scrotum.

Female genital anatomy in Classical bladder exstrophy

In females, a completely split clitoris can be seen next to the open urethral plate . The vaginal opening appears narrow and is placed anteriorly on the perineum. As the anus is ventrally positioned as well, the perineum is shortened.

Epispadias in both sexes

The epispadias(E) defect in both sexes results from a developmental arrest in terms of non-closure of the urethral plate and additionally in an abnormal dorsal urethral location.

Therefore, in males an ectopic meatus or a mucosal strip is found on the penile dorsum and in females a variable cleft of the urethra is detected. According to the meatal location, E is distinguished as either penopubic, penile or glandular in boys. In girls, E is divided into three degrees according to Davis [1], either less severe with a gaping meatus, intermediate or severe with a cleft

involving the whole urethra and the bladder neck, additionally displaying bladder mucosal prolapse. Abdominal wall and rectus anatomy, as well as the umbilicus, are

completely normally developed. In both sexes symphysis is closed or only a minor symphysis gap is palpable, indicating only minor pelvic and pelvic floor anomalies.

Urinary incontinence appears to be the main clinical symptom, due to the degree of involvement of the urinary sphincter. In most distal E, involuntary urine loss is not observed, whereas in complete E urine is dripping permanently through the meatus in both sexes. Due to the sometimes minor clinical abnormalities, distal E might be overlooked at birth, especially in girls. Then diagnosis may be recognized as late as at school age, due to urinary incontinence, resistant to standard treatment.

Cloacal exstrophy

Cloacal exstrophy, as a major birth defect, involves several important organ systems. Beside the exstrophy at birth, omphalocele, imperforate anus and spinal defects may be present and mandate immediate surgery. Usually, a foreshortened hindgut or cecum ends between the two exstrophied hemibladders. The orifice of the terminal ileum is located at the everted cecum. The symphysis pubis is widely separated

and the pelvis is, in contrast to Classical bladder exstrophy, often asymmetrically

shaped. The genitalia, for instance the penile or clitoral halves, can be located separately on either side of the bladder plates together with the adjacent scrotal or

labial part

Etiopathogenesis

Embryology

In 1964 Muecke was the first to report that mechanical disruption or enlargement of the cloacal membrane in chicks prevents the invasion of mesodermal cells along the infraumbilical midline, and thereby results in exstrophy [7]. Based on that, Austin et al. provided evidence that in humans, anomalous overgrowth of the cloacal membrane is associated with bladder exstrophy [8]. Animal models of EC support the idea that abnormal partitioning of the cloacal membrane causes displacement of

the genital tubercle and therefore epispadias formation.

Accordingly, on the basis of a developmental study of hereditary anorectal malformations in pig embryos, it has been concluded that agenesis of the dorsal part of the cloacal membrane may form the basis of congenital malformations of cloaca-derived orifices such as hypospadias, epispadias, bladder and cloacal exstrophy, double urethra, and cloacal membrane agenesis.

Thomalla et al. created a hernia defect of the lower abdominal wall of chick embryos by incising the cloacal membrane with a laser [9]. The resulting chicks were born with EC, supporting the idea of premature rupture of the cloacal membrane. The timing of cloacal membrane disruption in this model determined the resulting variant of the EEC, with an earlier disruption (4-6 gestation weeks, before fusion of the urorectal septum to the cloacal membrane) leading to the more severe EC [1].

Only one gene, *p63*, apart from causing congenital defects of the extremities and skin, has been shown to completely reproduce human bladder exstrophy in *p63*/- mice. As noted by Ince et al., female *p63*-/- mice exhibited abnormal genital morphogenesis with

hypoplastic genitalia, a single cloacal opening, and persistence of columnar epithelium at lower genital tract sites [10].

Diagnosis

Clinical

EEC diagnosis is usually made clinically by inspection after birth.

Laboratory studies

EEC specific laboratory tests are not available. In EEC after birth, routine laboratory studies should include a basic metabolic panel including assessment of baseline renal function as a minimal standard before any urinary tract reconstruction. Especially in EC, an inherent short gut syndrome can result in significant electrolyte losses from the terminal ileum. Routine genetic screening of patients and parents outside of scientific studies is not yet recommended

Imaging studies

Sonography as a primary study

After birth, sonographic baseline examination of the kidneys is mandatory for all EEC patients. Later on, irrespective of the method of reconstruction, renal sonography is a perfect screening method for distinguishing any upper urinary tract changes during follow-up.

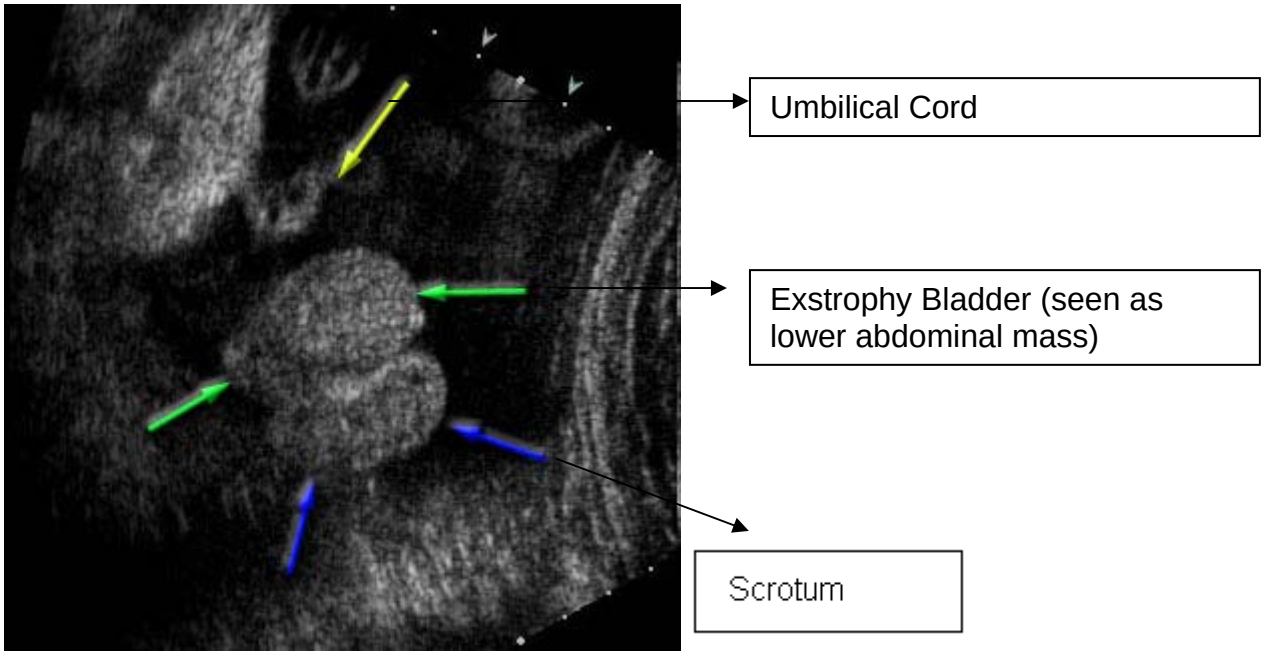
Follow-up studies

It is reasonable to evaluate the reconstructed bladder with a voiding cystography and urodynamic studies via a suprapubic tube. Thus, it is possible to monitor bladder storage function with sensation, detrusor activity, compliance and capacity during filling, as well as bladder emptying function with voiding and leak-point pressure and
residual urine measurements. These studies provide objective evidence about outcome results after bladder neck plasty and help to avoid secondary complications as upper tract deterioration.

Antenatal diagnosis and genetic counseling

Prenatal diagnosis

Due to high-resolution real-time ultrasound, prenatal diagnosis of EEC is usually possible between the 15th and 32nd week of gestation, depending on the severity of the defect and the expertise of the sonographer.



The index finding is the non-visualization of a normally filled fetal bladder during repeated careful ultrasound examinations. In a retrospective review of 25 prenatal ultrasound examinations during pregnancies resulting in a newborn with CEB, a low-set umbilicus, a wide ramus pubis, diminutive genitalia and a lower abdominal mass were summarized as diagnostic key factors for EEC diagnosis, in addition to the absent bladder filling [1]. Another typical feature is a wavy cord-like segment of soft tissue protruding from the anterior abdominal wall, just below the umbilical cord insertion, strongly resembling the trunk of an elephant [1,11,12]. Gambhir et al. described that mothers of children with EC knew significantly more often prenatally that their child would have a congenital malformation than mothers of children with E or CEB did [7]. Though prenatal intervention is not necessary, early diagnosis allows optimal postnatal management. Centers that favour early closure within first hours of life, advocate scheduling of the delivery in or near a pediatric centre, familiar with optimal treatment of the severe congenital anomaly.

Management

Bladder exstrophy repair

Attempts at primary closure of bladder exstrophy date to at least 150 years ago. Initial efforts were directed at partial reconstruction of the abdominal wall to allow the application of a urinary receptacle to collect urine. The first successful record of this form of repair is attributed to Dr. Pancoast in 1859. He used skin flaps from the abdominal wall. These procedures represented early attempts at anatomic closure but did not address the functional reconstruction of these bladders - namely, the achievement of satisfactory storage and emptying of urine. In 1881, Trendelenberg described an exstrophy closure, emphasizing the importance of creating a solid wall through pubic re-approximation in front of the reconstructed bladder to achieve continence. Unfortunately, this effort also proved unsuccessful [13]. Because of these discouraging results, bladder reconstruction in exstrophy was largely abandoned and replaced by ur nary diversion, most notably ureterosigmoidostomy or an iliel/colonic conduit with placement of appropriate appliance over it for collection of the urine.

However, throughout this century, attempts to achieve a successful primary exstrophy closure have continued. H. H. Young reported the first successful primary bladder closure in 1942 [14]. He achieved urinary continence after reconstruction in a young girl. On the other hand, beside clinical observation, urodynamic studies reported a normal filling and emptying pattern, but impaired compliance and stability, mostly after Young-Dees-Leadbetter bladder neck reconstruction [14]. This bladder neck reconstruction is nowadays judged as a not nerve-sparing technique, maintaining normal

detrusor function in only approximately 25% of cases [16). In addition, it is an issued statement that bladder neck reconstruction has the ability, though a passive mechanism of increased subvesical resistance, to lead to complicated bladder emptying in every case. Most other authors insist on the terminus continence implying a possible active, not scarred, and not obstructed emptying ability of the bladder neck region [1].

Based on retrospective studies, the primary successful operative attempt to the bladder template is claimed to be the main predictive factor for a successful outcome. Until now, quality and size of the bladder plate and its genuine influence on the outcome of a functional reconstruction is not possible to predict.

As a result, surgical efforts were subsequently directed toward staged bladder re-construction, an approach pioneered and advocated by Dr. Robert Jeffs [7]. This approach has subsequently become the standard of care for bladder exstrophy for many years.

. As a modification, the so called "modern staged approach" is currently advocated by John Gearhart [1]. He made this three-stage concept - beginning with closing the bladder, the posterior urethra and the abdominal wall after pelvic ring adaptation within the first 48 hours of life - popular to many other experts worldwide [1]. **The main arguments favoring early bladder closure in neonates within the first hours of life are:**

1. protection of the bladder mucosa against environmental influences,

2. physiological development of bladder musculature with regular bladder cycling and

3. more virtual anatomical conditions for bladder neck and antireflux reconstruction when bladder capacity has increased.

As a complete one-stage concept, Mitchell introduced his primary complete bladder closure with simultaneous correction of the epispadias using the penile disassembly

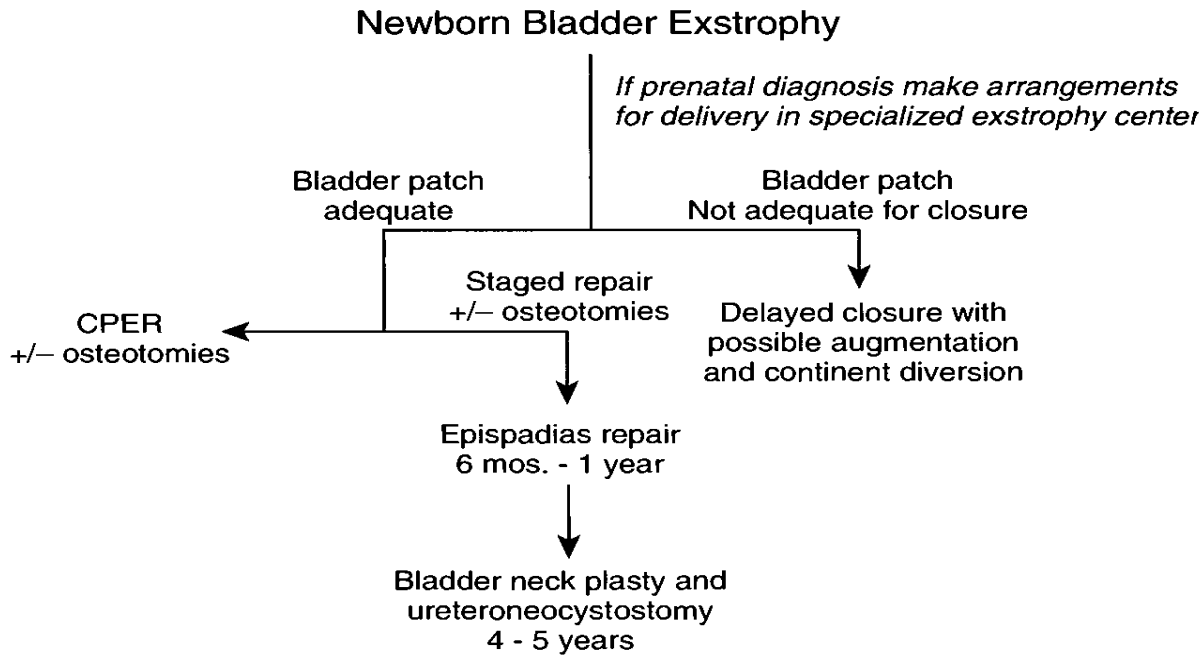
technique [17]**. Based on the hypothesis that bladder exstrophy results from anterior herniation of the bladder, the operative approach must address the bladder, bladder neck and urethra as a complete unit and move this unit permanently into the pelvis.**

Mitchell impressively demonstrated that penile dissection into its three components (two corpora cavernosa and the corpus spongiosum) ensures blood flow in each component and that the penis can be re-assembled in an anatomically correct configuration [17]. The penile disassembly technique applied simultaneously with bladder neck reconstruction however, comprises many pitfalls possibly leading to disastrous uro-genital damage when the required accuracy and expertise is not guaranteed. Since 1976, another one-stage complete reconstruction concept has successfully been realized in Germany by Schrott [18]. Reconstruction is timed between the eighth to tenth week of life when the baby has stabilized and all necrotic umbilical cord residues have fallen off. For the first weeks of life the bladder plate is protected with topical ointment against inflammatory and mechanical alterations. Definitive bladder size can only be estimated by sterile digital examination, detecting hidden bilateral bladder recessus during operation. Then the decision can be made whether the complete reconstruction is possible at that point. After circumcision of the bladder plate, pubovesical and pubourethral ligaments are completely divided from the ischiopubic rami down to the levator plate and caudal to the urethra ascending bilaterally from Alcock's canal to the penis or the clitoris. This complete mobilization enables anatomically correct backwards relocation of the bladder deep into the pelvis and prohibits bladder burst. An oblique incision is performed on each side up to the lateral margin between the upper and lower parts of undamaged trigone, splitting the area between the bladder, posterior urethra and the attached neurovascular bundles. The

elastic trigonal muscle is tubularized for urethral prolongation and the anterior bladder wall is reinforced by a second muscular invagination. As the newborn and infant pelvis is soft enough, the symphysis is approximated in a stepwise fashion with the help of a traction bandage. Intraoperative readaptation of the symphysis pubis is secured with absorbable polydioxanone traction sutures.

The advantages of every early one-stage approach are the summation of all major reconstruction steps with less scars, an unimpeded access to the bladder neck region, and a expectable rapid developing bladder capacity by rhythmic filling and passing urine against adequate resistance.

Outline summating the general guidelines for Exstrophy repair: [6]



(CPER – Complete primary exstrophy repair).

Technique of Stage one Reconstruction (Jeffs et al, Ducket and caldamone)

The initial bladder closure and urethral reconstruction in staged repair essentially converts the exstrophic bladder into an incontinent epispadias.

Traction sutures are placed in the glans penis, and ureteric catheters are secured each side. The incision is made around the periphery of the exstrophic plate, with care taken not to include any abdominal skin. The incision is then extended distal to the veru montanum on both sides of the prostatic urethra, leaving a wide plate of bladder neck and prostatic urethra. The umbilical cord is excised. The bladder is completely mobilised, with preservation of its blood supply. The corpora cavernosa are dissected off the inferior pubic rami as far as permissible to preserve the neurovascular bundles. The corpora are then approximated carefully in the midline to promote penile lengthening. The paraexstrophy flaps are mobilised, extending them along the side of the proximal urthral plate in such a fashion that ischaemia is prevented. They are then approximated in the midline and to the base of the bladder with absorbable sutures. The bladder and neo-urethra are tubularised after exteriorizing the ureteric catheters and placing the Malecot SPC and a small urethral stent. Pubis is approximated anteriorly to protect the bladder closure and urethral reconstruction from tension. Most surgeons believe that pubic approximation promotes healing and subsequent continence. Closure of the pelvic ring is performed with a single non absorbable suture or Teflon tape, placing the knot and suture anterior to the pubis to avoid erosion into soft tissues below. However, in children older than 3 or 4 days usually need osteotomies. Pubic approximation also eliminates or minimizes the need for creating fascial flaps, facilitating easy closure of rectus fascia and skin.

Closure in female child is similar, except that a traction suture is placed above the vagina, and vagina is fully mobilised as a neourethra is created. The vagina is then brought downward to assume a caudal angle of entry.

Pelvic Osteotomy

The practice of pelvic osteotomy is somewhat controversial. Some, including Marshall and Mauecke, advocate pubic approximation without osteotomies. Others use anterior innominate or superior ramus osteotomies, particularly because they do not require turning of the child. Some favour posterior iliac osteotomy. Kelly mobilises only the inner layer of the periosteum of the pubic ramus and muscle. Gearhart recommends anterior innominate and vertical iliac osteotomies in children older than 72 hrs, in any child with non malleable pelvis, and in those whose pubic bones are separated 4 cm or greater.

Because of the high incidence of vesicoureteral reflux, some authors prescribe low-dose suppressive antibiotic therapy for all newborns after surgery. This therapy is continued until vesicoureteral reflux is corrected surgically or resolves spontaneously.

Postoperative factors recognized to increase the success of the initial reconstruction include the following:

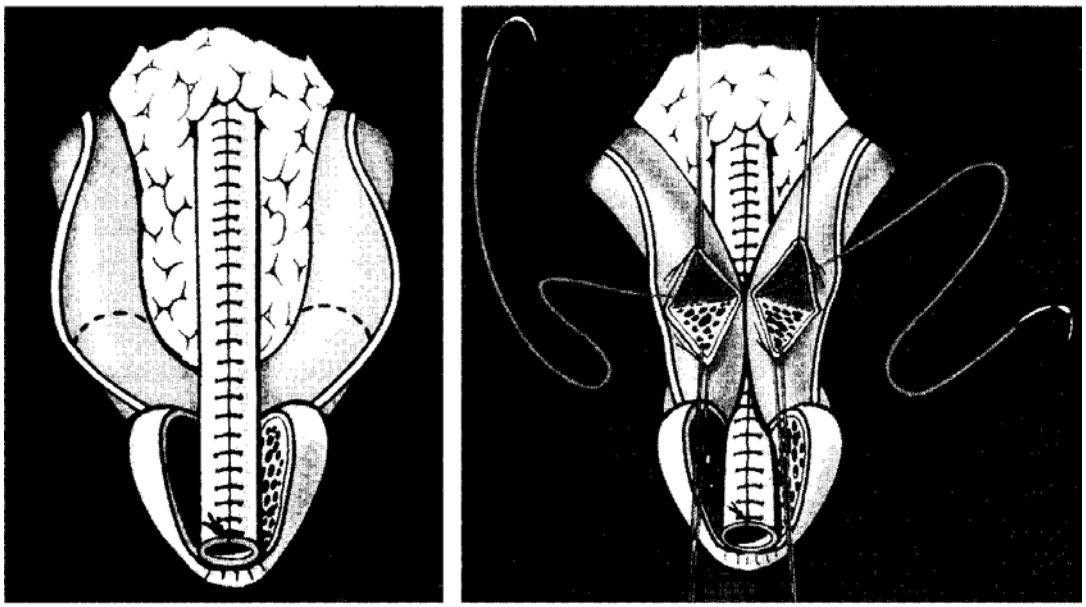
- The use of osteotomies (in selected cases)
- Postoperative immobilization
- The use of postoperative antibiotics
- Ureteral stenting catheters
- Adequate postoperative pain management
- Avoidance of abdominal distension
- Adequate nutritional support
- Secure fixation of urinary drainage catheters

Technique of Stage two Reconstruction

In the male, second stage of repair involves reconstruction of the phallus i.e., Epispadias repair, performed between 6 – 12 months. The goal is to provide adequate phallic length with appropriate dangle and release of the dorsal chordee, and urethral reconstruction to allow voiding from the glans penis.

The Ransley-Cantwell technique permits mobilization of the penile urethra to the ventrum and adequate correction of the dorsal chordee with a low fistula rate.

Ransley-Cantwell technique



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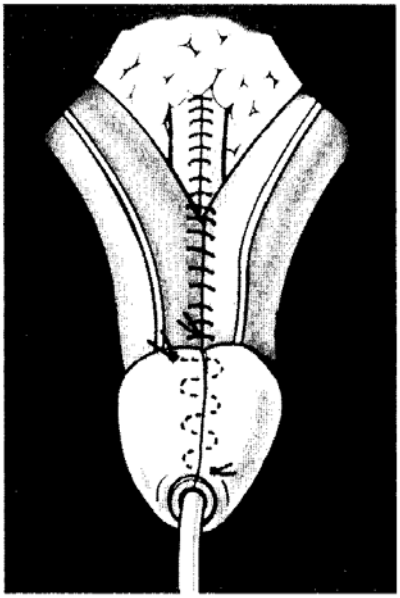

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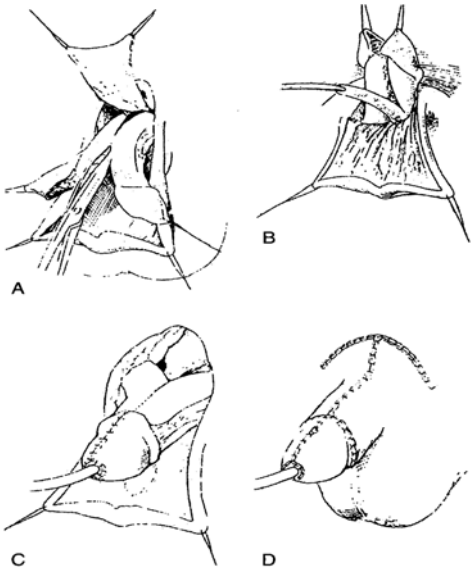
Important point is that the dorsal urethral plate is left intact, having been mobilised from the dorsum and ventrally between the two corporal bodies. If the urthral plate doesnot tether the phallus, it is left intact. If it foreshortens the phallus, it is divided, and inner prepucial or free graft may be added to the urethra.

Mitchell and Bagli, relying on the unique blood supply of the corpora cavernosa and the glans, separated the three components of the penis (urethral plate, right and left corporal bodies). This permits release of the rotation that contributes to dorsal chordee.



Complete penile disassembly technique – Mitchell, Bagli D K

Final stage reconstruction:

The final stages of reconstruction involve the construction of a continent mechanism, which is undertaken around 4 yrs of age. Many procedures have been described to reconstruct the bladder neck, but the Young-Dees-Leadbetter technique remains the most common.

The ureters are mobilised and reimplanted in a cephalad position in the bladder by either a cross- triagonal or a cephalotrigonal procedure.

One of the staged procedures is the Kelly technique, devised in the 1980s by Kelly in Melbourne. The unique aspect of this technique occurs at stage 2 and is termed RSTM (Radical soft tissue mobilisation), in which the urogenital diaphragm muscles, including their periosteal attachments and pudendal neurovascular supply, are detached from the medial pelvic walls and wrapped around the neourethra and vagina .No osteotomy is performed since RSTM allows sphincter construction and abdominal wall closure without

tension. Although the initial results of the Kelly procedure were reported in an abstract, no longterm outcome data are available in the literature.

Surgical outcome and results

Though countless publications on EEC exist, surgical outcome data have mostly been ascertained retrospectively, as single-center or single-surgeon experiences. Definitions of successful outcome, observation periods and end-points, as well as evaluation of complications and, in particular, terminology focusing on the terms "continence" or "social continence" diverge immensely. Woodhouse was the first who revealed that bladder function in EEC is not stable over time, and late failure with muscular atony may occur [17]. Nowadays, it is reasonable to expect continence rates of about 80% in childhood [1,15, 17]. Within this concept, however, though most exstrophic bladders can be preserved, spontaneous voiding is not guaranteed and, especially after childhood, an increasing number of patients need bladder augmentation or self catheterization either via the urethra or via a catherizable stoma. In our first 100 one-stage functional reconstructed EEC patients, 47 underwent a primary and 53 a redo reconstruction with a mean observation period of 11.1 years [17]. Complete continence after primary reconstruction with spontaneous voiding was possible in 72.3% of the patients; whereas reliable continence dropped after redo bladder neck plasty to only 41.5% [17]. These outcome data are comparable to other high-volume EEC centers [1, 17, and 18]. If primary closure fails, only 60% obtain adequate capacity for a planned bladder neck reconstruction in a staged concept. If the second closure fails, only 40% will have adequate capacity for a bladder neck reconstruction and only 20% will become dry .

Numerous possible complications (such as recurrent urinary tract infections, recurrent epididymitis, residual urine and therefore urinary calculi formation, *etc*.) may complicate the course of the disease and require meticulous long-term care.

Reconstruction failure after functional reconstruction

Reconstruction failure is usually assessed clinically, by endoscopy and with urodynamics. Identifying the medical problem, with simultaneous consideration of the individual and family history, should lead to further therapeutic recommendations. If bladder storage is impaired, the bladder can be augmented with bowel, preferentially with ileum or sigma. After augmentation, sufficient bladder emptying must be provided either through catheterization per urethram or through a catheterizable channel according to the Mitrofanoff principle. If the bladder neck resistance is low, injectable materials like dextranomer/hyaluronic acid can enforce urethral resistance [17]. This minimally invasive approach allows quite reasonable success in order to improve continence, but success will be only durable after at least 3 injections [17].

A definitive solution is bladder neck closure with creation of a catheterizable channel, but reliable compliance of patients and parents are of fundamental importance for success. In cases with bad bladder development, upper tract deterioration and continence is not achievable over a reasonable period and a well-balanced benefit-effort-analysis urinary diversion should be performed. Patient age, social background and life style should be taken into consideration to decide whether a catheterizable pouch or a sigma-rectum-pouch is chosen for urinary diversion.

Unresolved questions

Taking all treatment perspectives together, the most serious problem is the lack of any histological or clinical data allowing a reliable prognosis of future bladder growth and long-term storage and voiding function after birth. Therefore, the outcome and outcome-related prognostic factors are still unclear. Prospective outcome analysis is mandatory to further improve treatment strategies. In addition, current long-term outcome analysis now allows judgments to be made about treatment strategies implemented 20-30 years ago. A standardized follow-up program as a result of long-term outcome studies will definitely help to improve the final results and therefore lifelong outcome success.

Case Materials

1. A total of 102 patients presented to our hospital with a diagnosis of Exstrophy Epispadias Complex, including incontinent epispadias, between the years 1991 and 2009 were studied.

2. 77 patients were males and 25 were females, M : F Ratio of >3 : 1

3. Age at presentation was between infancy and 32 years, 3 subjects presented after 20 years of age.

4. Profile of the presented children (Total 102)

Fresh cases to CMCH (55)

New cases of Exstorphy –	50
New cases of incontinent epispadias –	5

Cases operated elsewhere/ earlier (47)

Status Exstrophy repair -	42
Status Ureterosigmoidostomy/ conduit	4
Status incont. Epispadias repair -	1

5. Presenting complaints

Fresh cases – 55

Cases already operated-

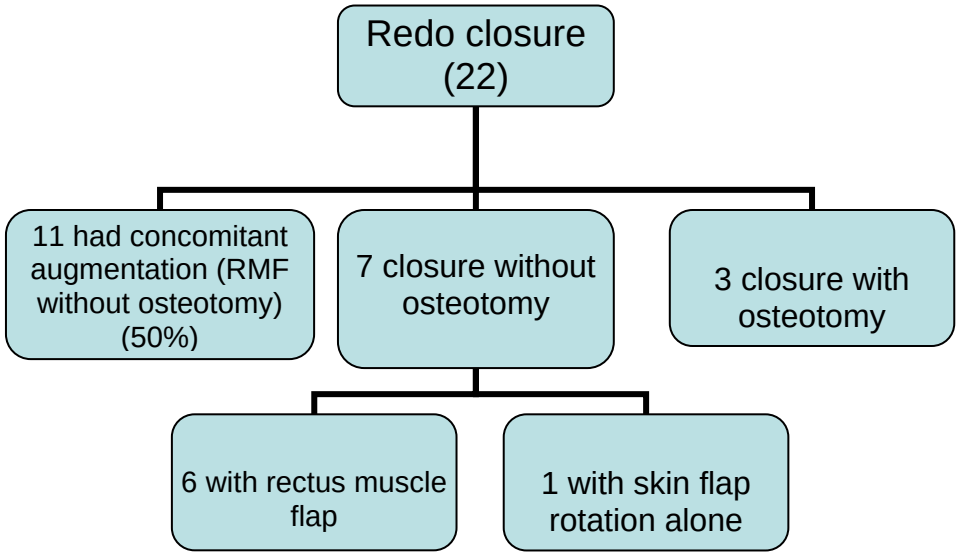
- Incontinence - 23
- Failed closure - 13
- Calculi - 9
- Fistulae - 4
- Bladder outlet obstruction 1
- Osteodystrophy 1
- Pubic bone sequestrum 1

Operative Methodology and follow up

Operations done after presenting to CMC

1**. Achieving Closure of Exstrophy**

1. Closure was done in all the 50 new cases, with (n=21) or without (n=25) osteotomy; and without osteotomy + concomitant augmentation in 4 children.
    i. A rectus muscle flap was used in those closed without osteotomy in 13 of 25 cases
    ii. Closure failed in 5 children (2 of 21 closed with osteotomy and 3 of 25 closed without osteotomy)
2. Those who had failure of closure: n = 22 (done earlier 17 + failed repair in fresh cases 5),



<u>Conclusion</u>: Rectus muscle flap is a very useful technique for achieving successful closure in varying ages, both in fresh and redo cases. Concomitant augmentation is also possible

2. For achieving continence : Assessment of continence after successful closure with or without concomitant augmentation

NEW CASES N= 45

Augmented primarily with closure: 4 All 4 continent

Continent with primary closure 6

Incontinent after primary closure 26*

No follow up 9

REDO- CLOSURE CASES N = 22 (17 + 5)

11 augmented at re-do closure -- 7 continent

-- 2 incontinent

-- 2 no follow up

11 redo done without augment -- 5* incontinent

-- 6 no follow up

Continence after successful bladder closure n=67:

Number of children continent: n = 17 (11 with concomitant augmentation)

Number of children incontinent:

- Among new cases -- 26
- Among Redo cases -- 7 (2 augm concom).

} n = 33

Number lost to follow up: n = 21

Conclusions:

a. After successful Ist stage closure (without augment)

6 / 32 were continent (~ 20%)

b. After successful closure (fresh / redo) with augmentation

11 / 13 were continent with cic (84%)

c. Redo closure without augmentation

5 / 5 were incontinent (100%)

Therefore, at redo-closure, concomitant augmentation may be a better idea

Total burden of incontinent children after successful bladder closure,

n = 33 + 23 (Operated elsewhere ref. case materials) = 56

3 of these were continent without cic following YDL procedure only

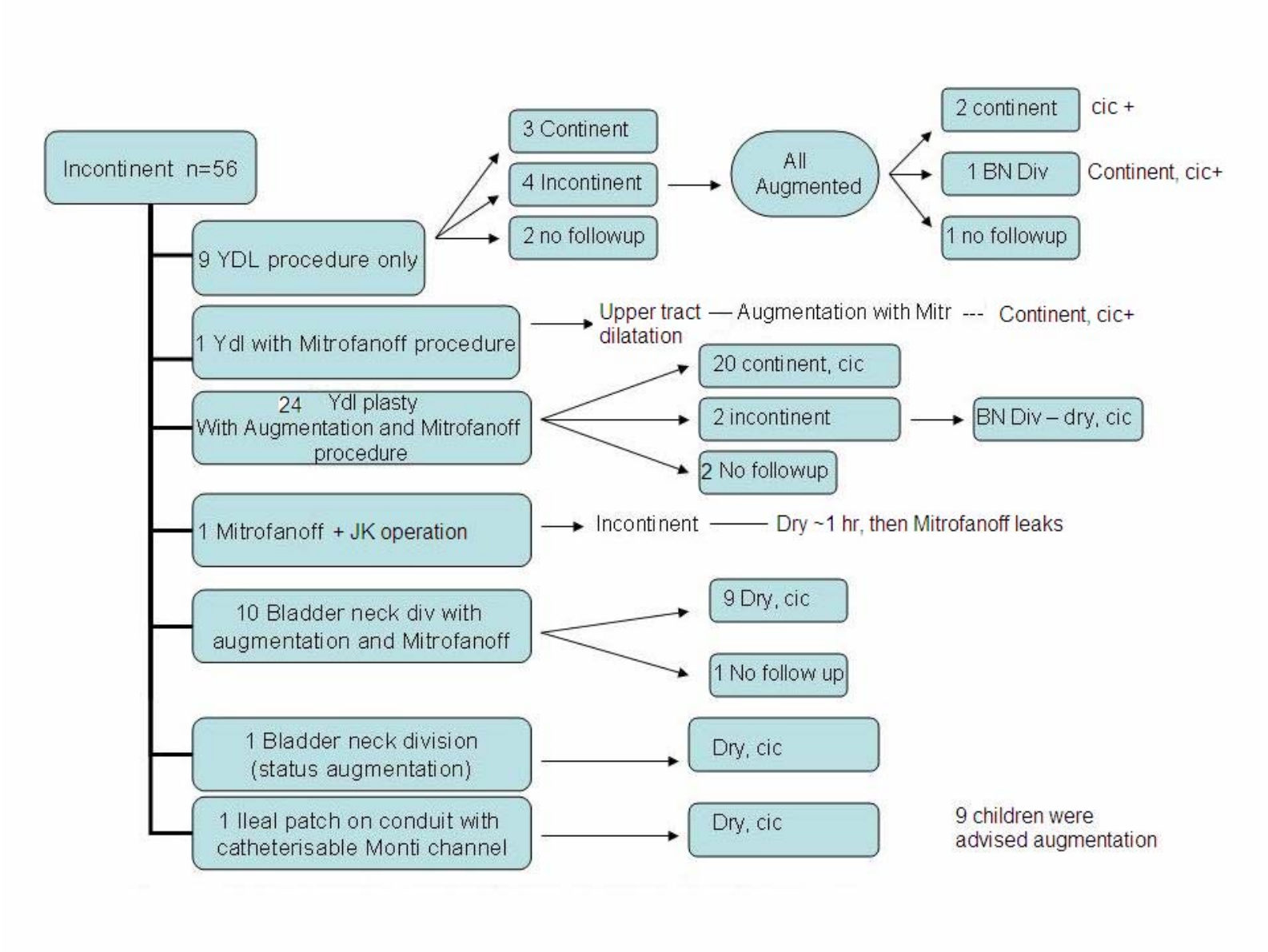
1 is continent for ~ 1 hr following Justin Kelly operation with Mitrofanoff and then leaks at the Mitrofanoff

39 followed up patients eventually required Augmentation with or without bladder neck division who are on cic

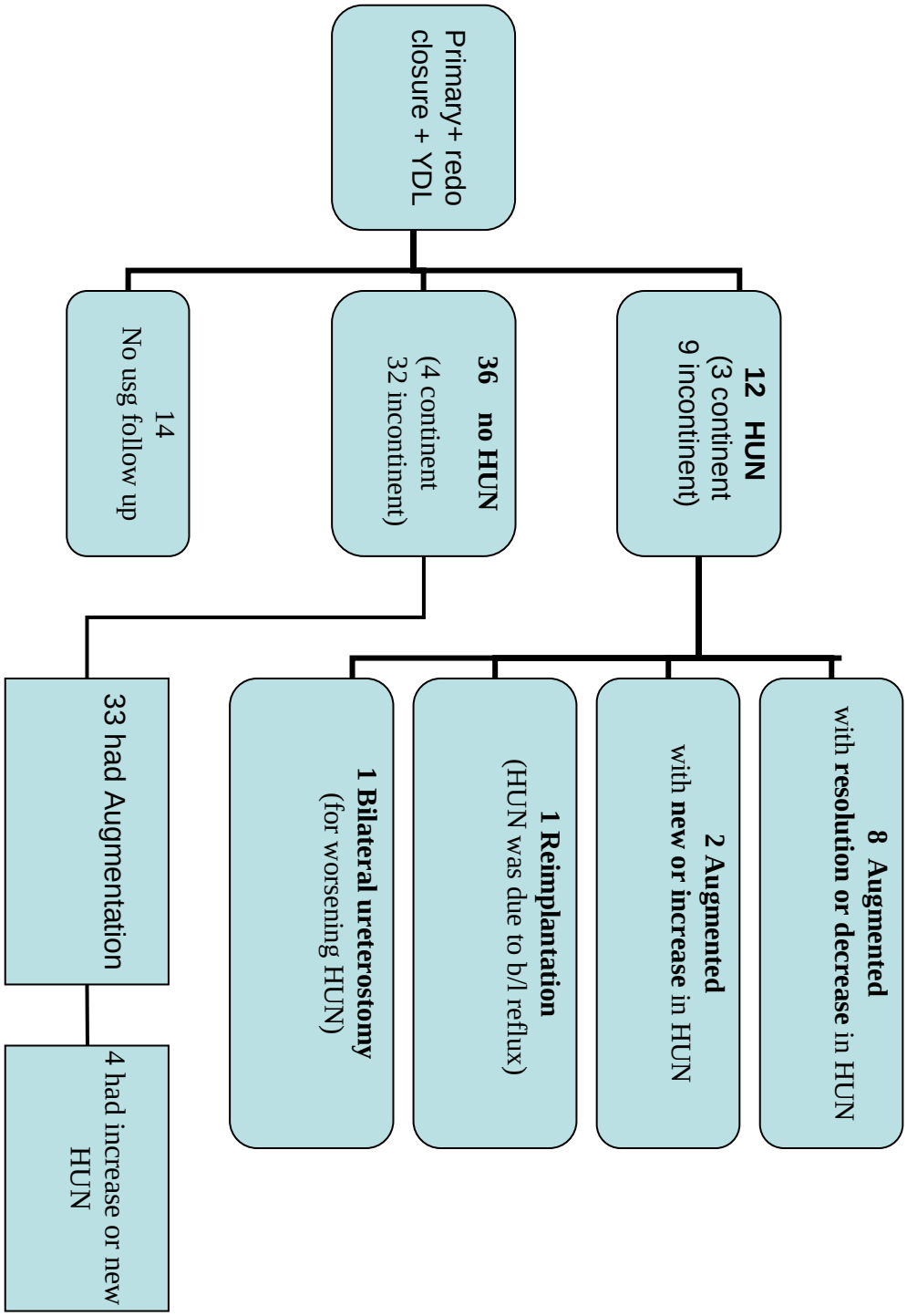
9 who did not have had any operations subsequently remained incontinent and have been given the option of augmentation

Conclusion: With subsequent surgery, 39 of 50 patients became dry – 78% (6 no follow up) of which all but 3 are on cic**. Therefore, augmentation with Ydl or bladder neck division is a good option as a continence procedure in those who remain incontinent after bladder closure.**

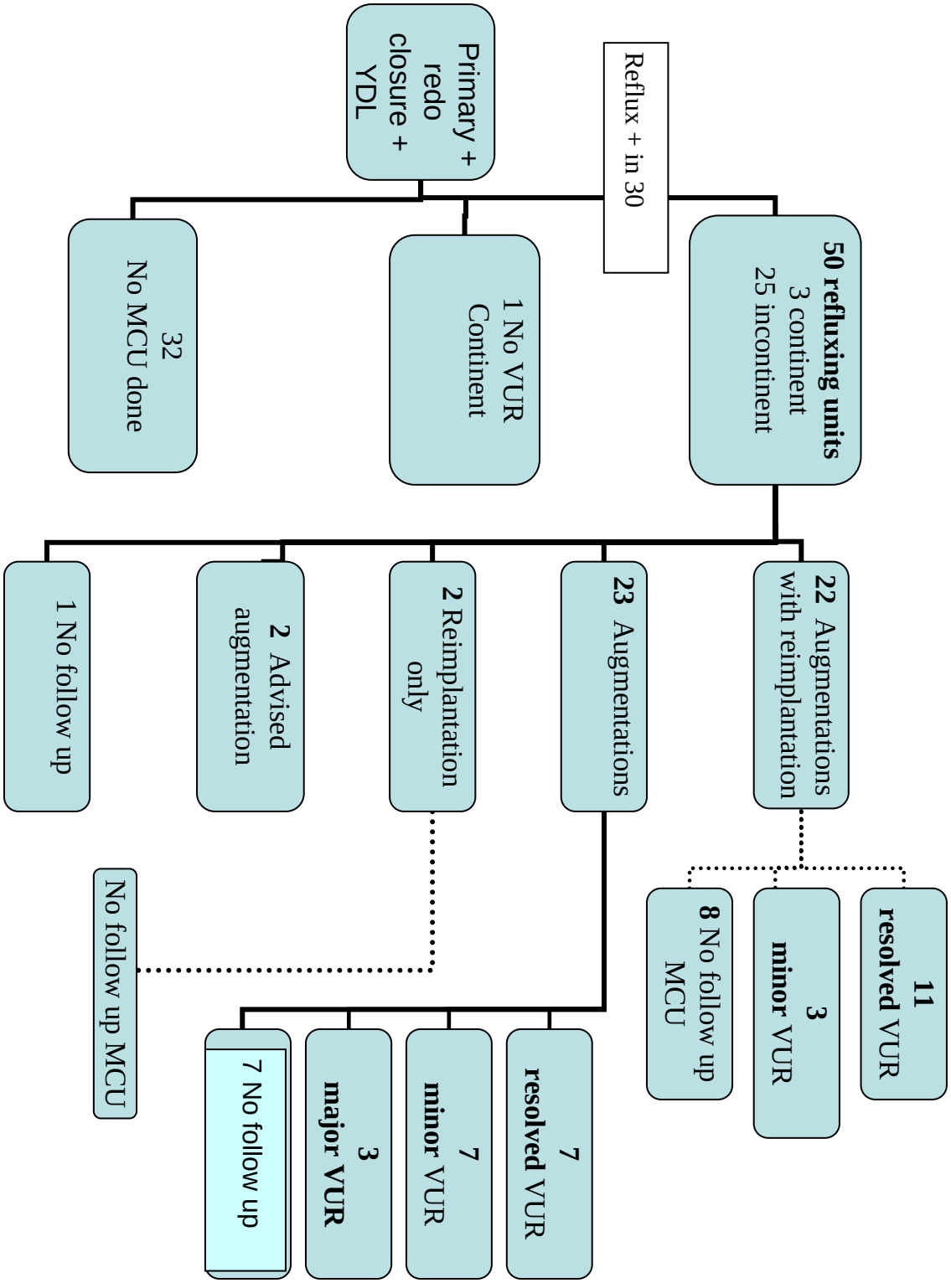
Follow up of the above patients summarised overleaf:


Incontinent n=56
9 YDL procedure only
3 Continent
4 Incontinent
2 no followup
All Augmented
2 continent
cic +
1 BN Div
Continent, cic+
1 no followup
1 Ydl with Mitrofanoff procedure
Upper tract dilatation
Augmentation with Mitr
Continent, cic+
24 Ydl plasty With Augmentation and Mitrofanoff procedure
20 continent, cic
2 incontinent
BN Div – dry, cic
2 No followup
1 Mitrofanoff + JK operation
Incontinent
Dry ~1 hr, then Mitrofanoff leaks
10 Bladder neck div with augmentation and Mitrofanoff
9 Dry, cic
1 No follow up
1 Bladder neck division (status augmentation)
Dry, cic
1 Ileal patch on conduit with catheterisable Monti channel
Dry, cic
9 children were advised augmentation

3. **Follow up of upper tracts** Ultrasound follow up in those with primary or redo closures and YDL procedure without augmentation



MCU follow up in those with primary or redo-closures and YDL procedure without augment



Conclusions:

USG:

- Hyronephrosis has resolved or decreased in 8 / 10 augmented patients (80%).

MCU:

- Following Augmentation and reimplantation of the refluxing ureters, resolution or reflux was seen in 11/14 (78.5%) while remaining 3 had minor reflux
- Following Augmentation alone, resolution was seen in 7/17 units (41%) while another 7 had minor and 3 had major reflux

Therefore while augmentation does improve the dilatation of the upper tracts, when it comes to the vesico-ureteric reflux, better results are seen when the ureters are re-implanted along with the augmentation

4. Total children finally Augmented: (For closure, incontinence, bilateral hydro-uretero nephrosis with reflux, high pressure bladder, recurrent calculi, bladder substitution for status ureterosigmoidostomy etc.,):

   n = 66

5. Overall results in children who underwent Augmentation and Mitrofanoff procedure (n=66):

a. Continence: Followed up in 55 cases

Continent, doing CIC	YDL BND	33 18 (Total 51)
Partly continent		2
Incontinent		2

b. Closure: All the followed up, augmented children (n=64) had satisfactory closure

c. Types of Augmentation done:

Sigmoid colon segment	39
Ileocaecal ‘doughnut’	24
Ileocaecal segment	1
Right colon segment	1
Ileal segment	1

d. Upper tract changes:

Ultrasound **Follow up in 45 cases**

Decreased / no HUN	**35**
Stable HUN	2
New / increasing HUN	8

MCU **follow up in 40 refluxing units**

Major VUR	6
Minor VUR	14
No VUR	20

Results

1. Overall results of children who underwent operation at presentation (follow up perid is between immediate post-operative to 20 years.

A) **Closure**: All children with follow up had satisfactory closure, after primary closure (with osteotomy, without osteotomy, with concomitant augmentation) or Redo closure for failed closure

B) **Continence**:

- After successful closure at presentation (without augment)

  6 / 32 were continent (~ 20%)

- After successful closure (fresh / redo) with augmentation

  11 / 13 were continent with cic (84%)

- Redo closure without augmentation

  5 / 5 were incontinent (100%)

Total burden of incontinent children after successful bladder closure,

n = 33 + 23 (Operated elsewhere ref. case materials) = 56

3 of these were continent without cic following YDL procedure only

1 is continent for about 1 hr following Justin Kelly operation with Mitrofanoff and then leaks at the Mitrofanoff.

39 followed up patients eventually required Augmentation with or without bladder neck division who are on cic.

9 who did not have had any operations subsequently remained incontinent and have been given the option of augmentation

With subsequent surgery, which includes YDL, YDL with Mitrofanoff procedure,YDL with Augmentation, BND with Augmentation, 39 of 50 patients became dry – 78% (6 no follow up) of which all but 3 are on cic**.**

C) **Upper tract changes**:

USG follow up in 48 children: 12 had hydro-ureteronephrosis

MCU follow up in 31 children: 30 had vesico-ureteric reflux (50 refluxing units)

2. Overall results in children who underwent Augmentation and Mitrofanoff procedure (n=66):

   a. Continence: Followed up in 55 cases

Continent, doing CIC	YDL BND	33 18 (Total 51)
Partly continent		2
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Major VUR	6
Minor VUR	14
No VUR	20

Discussion

Successful closure of the Exstrophy bladder has been a surgical challenge ever since there was a shift in the mode of management from urinary diversion, namely uretero-sigmoidostomy or urinary conduits, to primary bladder reconstruction. A successful repair should address the three important issues of abdominal wall closure, dryness and preservation of the upper tracts.

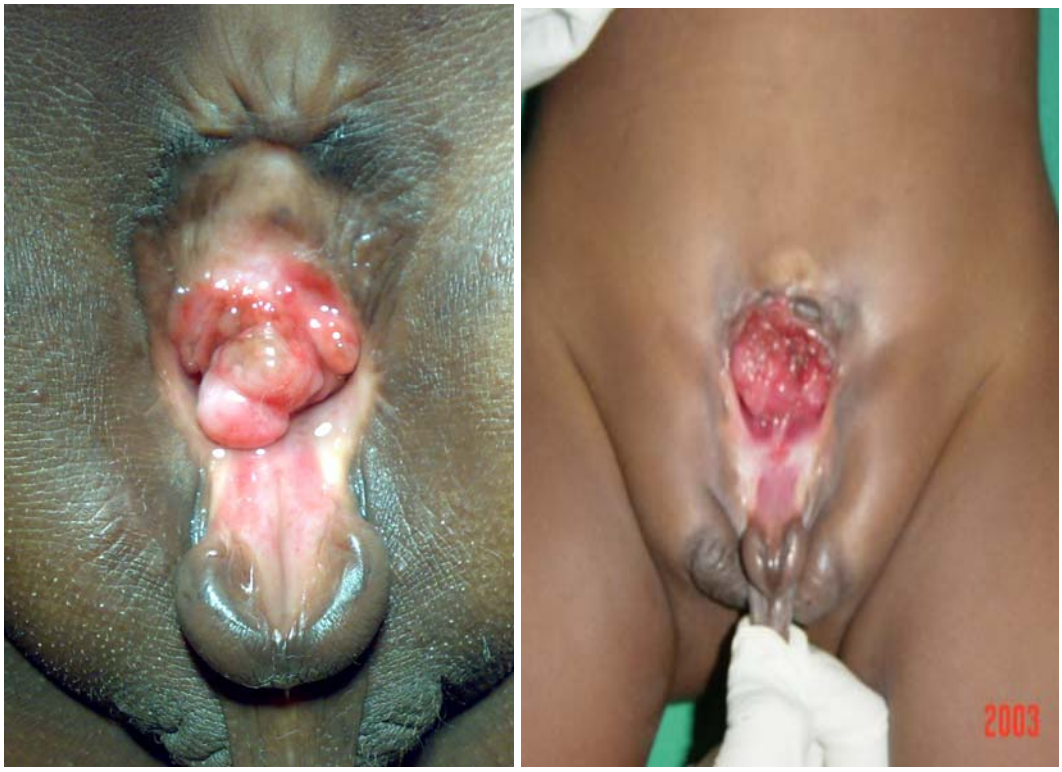
1. Closure of the Exstrophy:

Major challenges seen in our experience with Exstrophy repair are due to:

1. Type of cases that are referred to the tertiary care centre, that these children have a more **difficult bladder plate** which is stiff and not amenable to easy closure.

2. Presentation is **delayed for months or even years** where there are undesirable changes in the exposed bladder mucosa.

3. **Bony pelvic ring loses its pliability**, resisting pubic bone approximation. Pubic bone approximation is a key step in closure of Exstrophy, as reviewed in the literature. Any undue tension has a disastrous result, which is likely to happen when the pliability is lost **within few days of birth**.



Older children presenting with Exstrophy epispadias complex

4. The other group which present late are those **operated earlier on multiple occasions** and presented to us either with failed closure or with other complications.

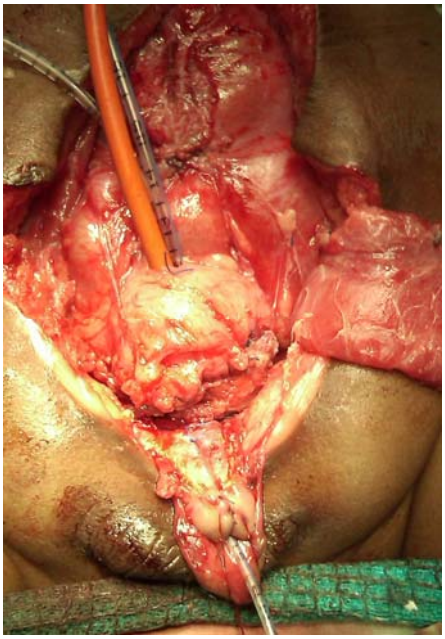
Solution: The problem of undue tension in repairing these cases has been dealt by us by replacing the technique of osteotomy and pubic bone approximation with "**closure without osteotomy using the rectus abdominis muscle flap**". This successfully

achieves tension free closure of the abdominal wall defect as well as covers the bladder neck area to prevent bladder neck fistulas.

Technique of Closure with Rectus Abdominis Muscle (RAM) flap:

Once the bladder plate is mobilised and closed, bladder neck reconstruction is done taking care that it is well mobilised, including the exposure of the superior and posterior surface of the pubic bones and the anterior limit of the pelvic diaphragm, such that the bladder sinks well posteriorly into the pelvis. Urethral tubularisation is done over a catheter which is left in place.

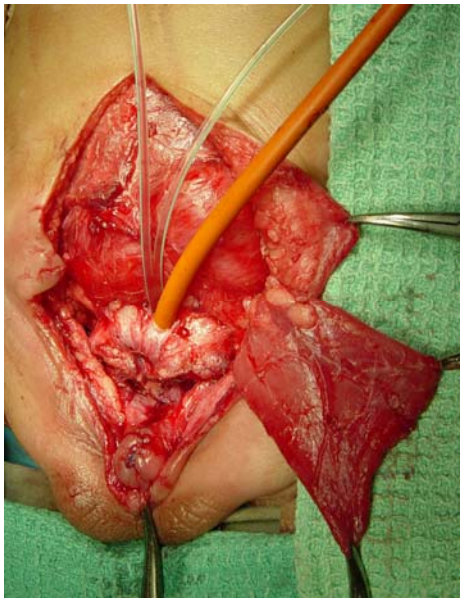
Mobilisation of the bladder plate to expose the pubic bars and intersymphysial band



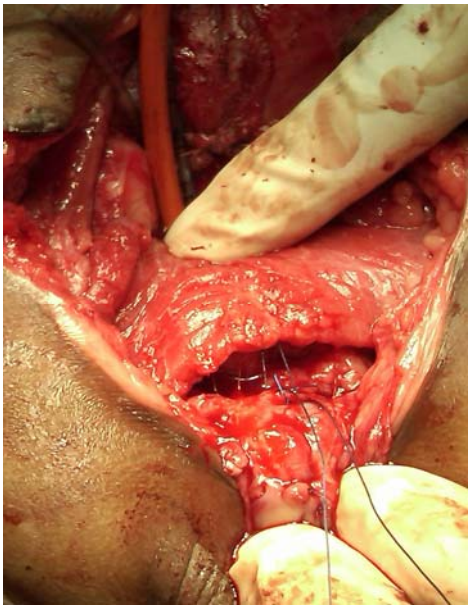
Bladder closure and perineal muscle approximation at the neck with tubularised urethra

The Rectus abdominis muscle, mostly the left one is dissected starting with opening of the anterior rectus sheath medially to expose the muscle and transecting it as high as possible to get a good length of muscle attached at the lower end. It is gradually

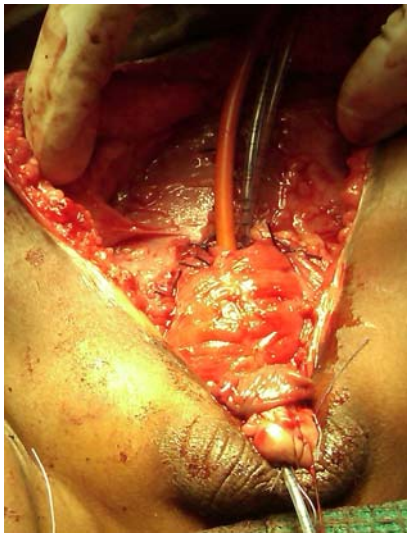
separated from rest of the sheath by sharp dissection, ligating the small perforators on the lateral aspect. Care is taken not to injure the inferior epigastric vessels seen on the posterior surface of the muscle coming from below.



Left RAM flap

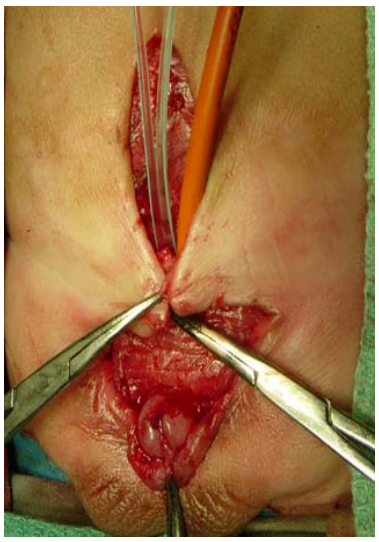


Turned across the defect



And secured over the repaired bladder and bladder neck

This muscle is then rotated down and secured over the closed bladder across the abdominal defect and tubularised bladder neck by suturing the transacted end of the muscle to the medial border of the right rectus sheath. The ureteric stents and SPC Malecot catheter exit the bladder at the upper border of this turned muscle flap.



Abdominal skin closure

Ventral prepucial skin for penile cover

This is followed by abdominal skin closure and penile reconstruction. **The ventral penile skin is used to get a circumferential skin cover.**

2. Continence

Complete dryness with spontaneous voiding was seen in 18 % of patients after primary closure of the Exstrophy. **Some children needed an additional bladder neck procedure for continence. The down fall of this procedure was excessive bladder outlet resistance, retention, resultant upper track dilatation, and urinary tract infections**.

Bladder augmentation with a catheterisable Mitrofanoff port was needed in about half of these children (27/56) to achieve a low pressure urinary reservoir with continence and 8 children have been advised augmentation for the same reason

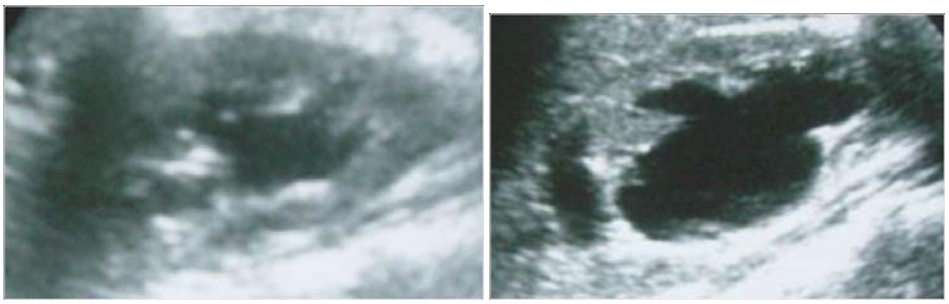
10 children required bladder neck division with augmentation and Mitrofanoff procedure. Children who remained incontinent after YDL and augmentation underwent bladder neck division (2).

3. Upper tract changes:

As seen in literature review, our children achieving some degree of continence, as well as some children with incontinence have shown dilatation of the upper tracts (12 of 48 scans) on follow up scans after primary or redo closure and those who underwent additional bladder neck procedure.

Almost all of the children with MCU follow up showed vesico-ureteric reflux.

The contributory factor for the upper tract changes are excessive resistance to the bladder outflow, small capacity bladder and impaired compliance and stability.



Bilateral hydro-ureteronephrosis following closure

These children required Augmentation of the bladder with Mitrofanoff procedure with many having resultant decrease or resolution of Hydronephrosis as well as of reflux.

Resolution of HUN following Augmentation with Mitrofanoff

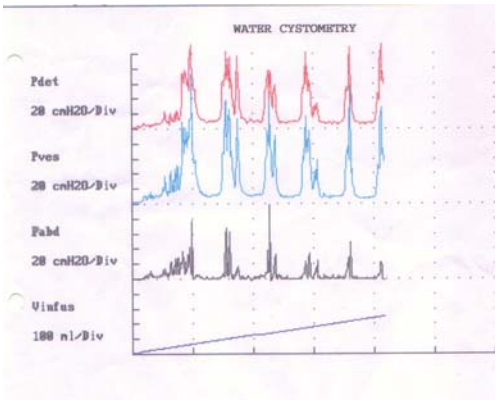
Post primary closure with B/L VUR Resolution after Augmentation

Problems with Bladder contractility

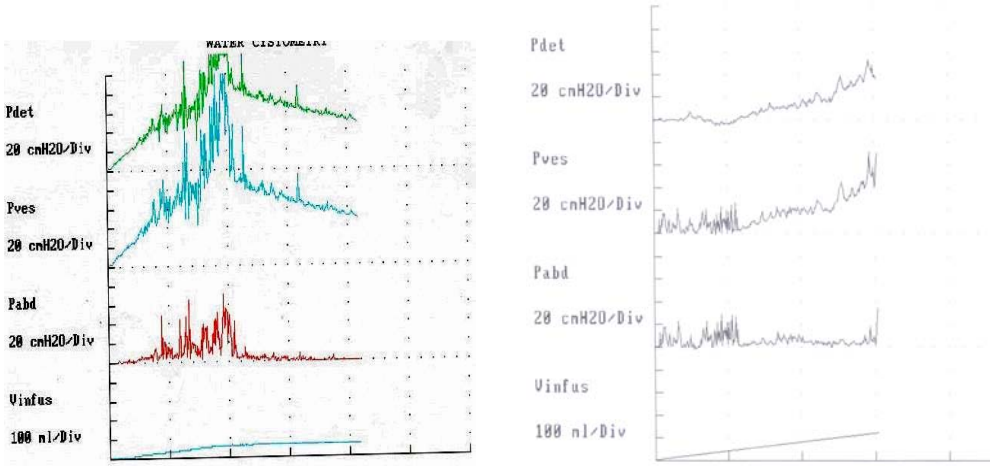
In some children who had primary closure and bladder neck procedure along with closure or at a later stage, though they achieved continence, their bladders showed evidence of impaired contractility and compliance.

This was either in the form of

1. Unstable **bladder contractions with reduced compliance**

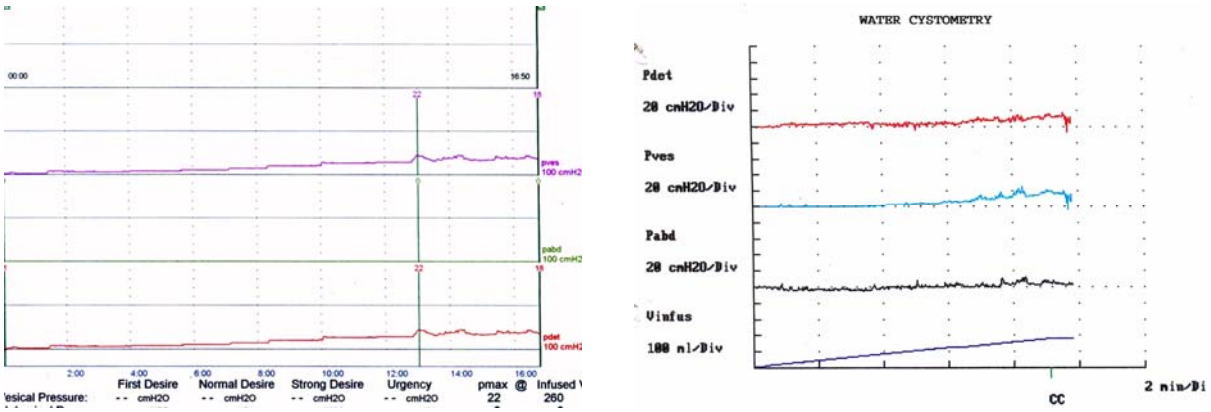


Small capacity bladder with unstable contractions



Poor compliance bladders

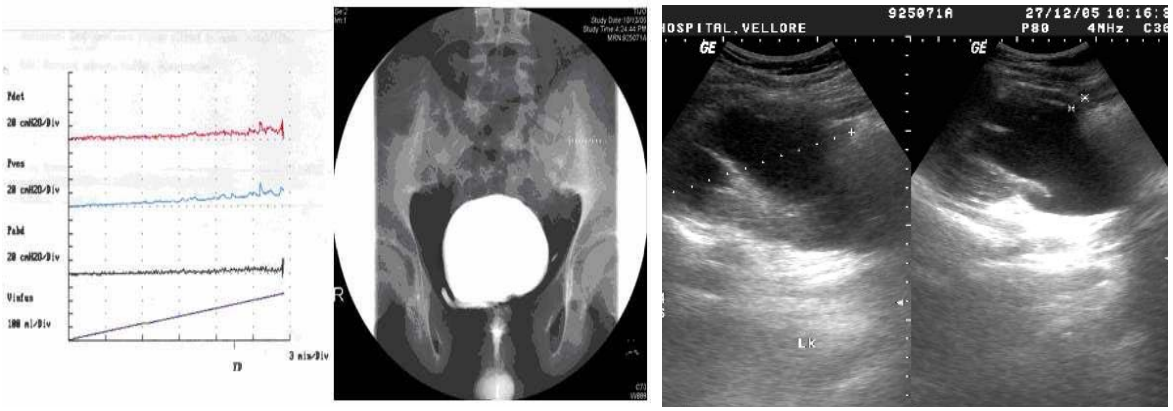
Post Augmentation:



CMGs of children post augment showing good compliance

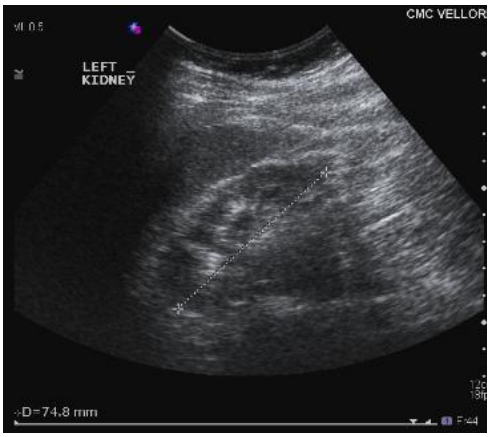
These high pressure systems are effectively dealt with bladder augmentation to convert them into low pressure continent urinary reservoirs.

2. Detrussor failure over prolonged periods of time



15 years post exstrophy repair with myogenic failure, left HUN and hypertension

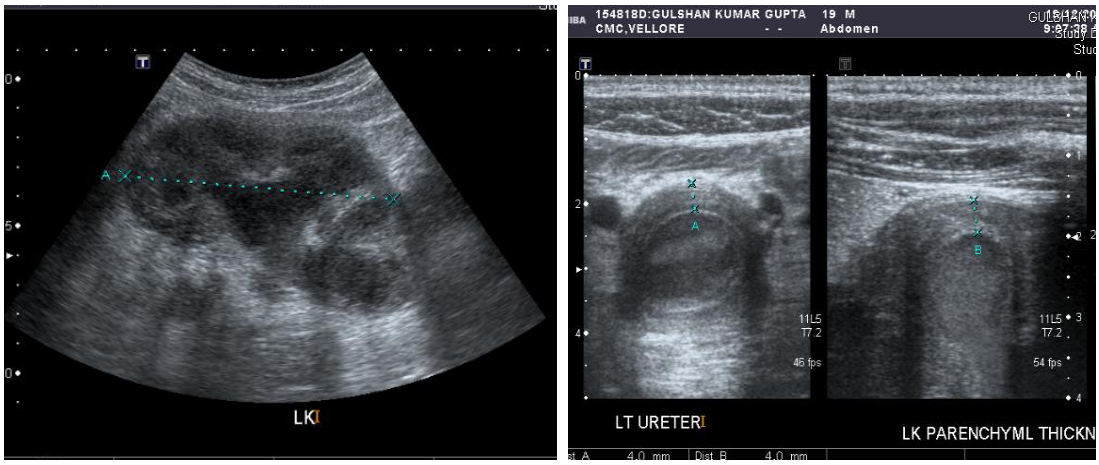
Augmentation was done in the same child for addressing incontinace. A follow up ultrasound showed resolution of the left hydronephrosis



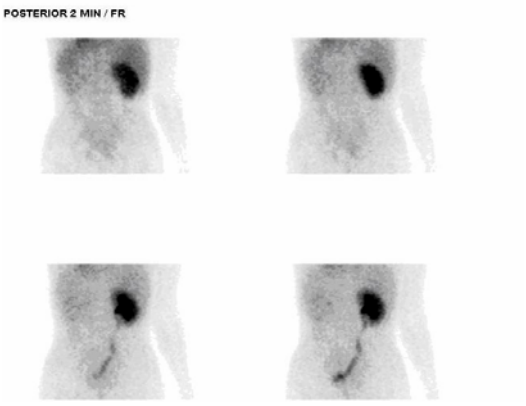
Post augmentation resolved Hydronephrosis

Problems with Urinary diversions

A 21 year old man who had undergone excision of the exstrophy bladder and Uretero-sigmoidostomy elsewhere presented with **recurrent left pyelonephritis**.



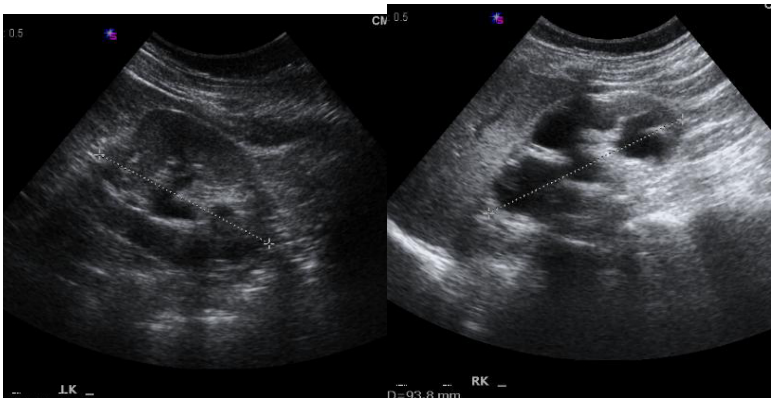
Left Hydroureteronephrosis with debris and thin parenchyma



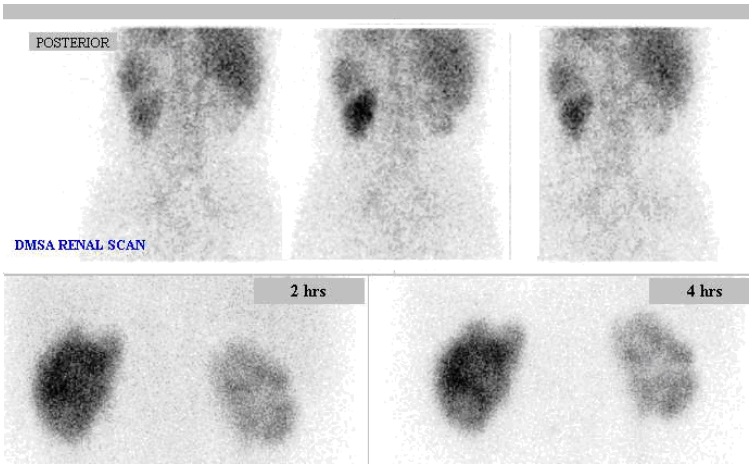
DMSA scan showing non-functioning left kidney

He underwent Ileo-caecal doughnut substitution with catheterisable insitu appendicular port with left nephrectomy.

Another child with Exstrophy excision and Ileal conduit on long term follow up into adulthood developed progressive dilatation of the conduit and urinary stasis with resultant chronic renal failure and hypertension



Bilateral hyroureteronephrosis



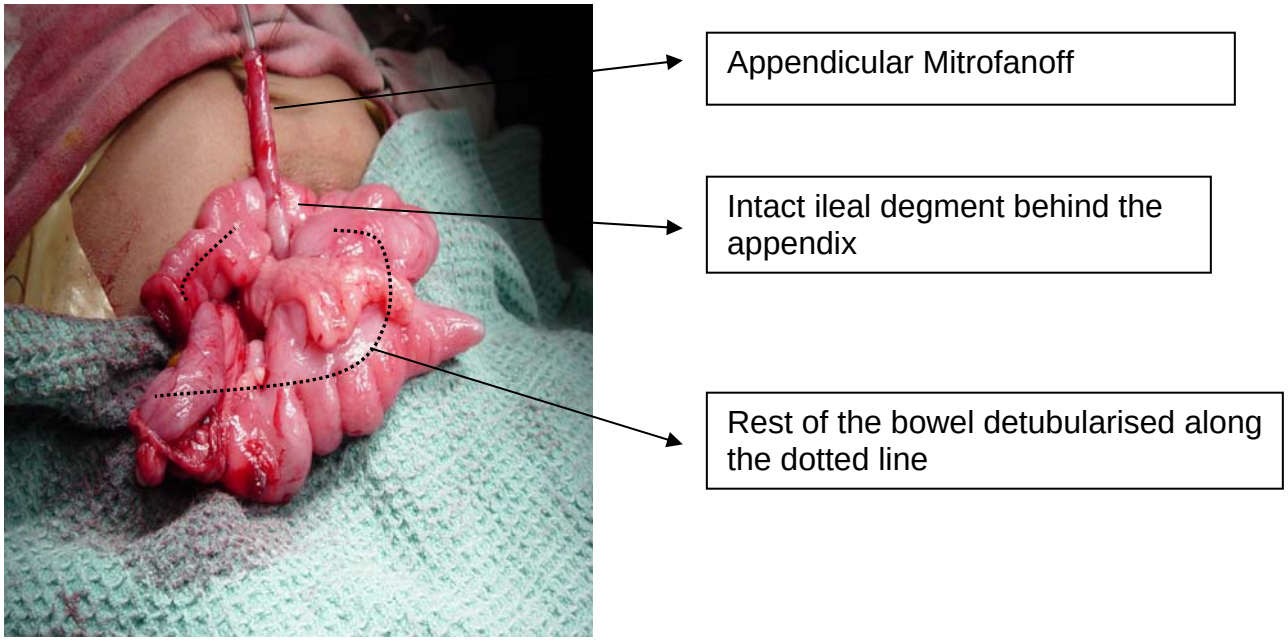
Renogram showing left upper pole and right renal scars

These two case reports illustrate the renal loss and renal failure in chronically diverted systems

Bladder Augmentation:

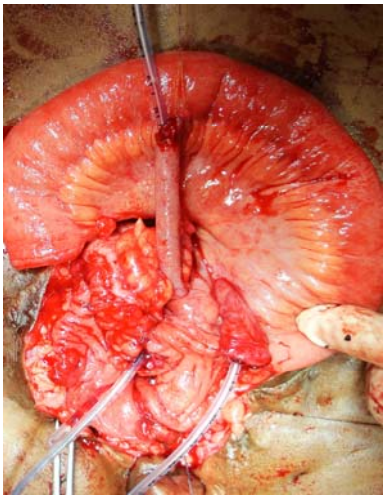
In **most of the children requiring Augmentation, Sigmoid colon was used** to augment the bladder. **But lately, Ileo-caecal segment with insitu Appendix is used**, in the form of a **Doughnut of bowel around the appendicular Mitrofanoff**, in almost all the children requiring augmentation.

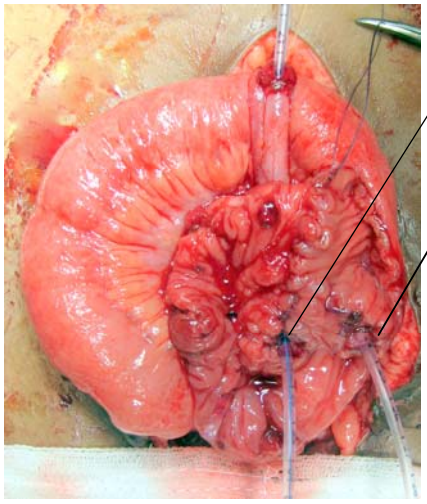
In this method, the ileo caecal segment is isolated on its pedicle. The caecum and the adjoining ileum is detubularised in continuity avoiding the appendicular aperture in the caecum. A short length of ileum is left intact and then the rest of the ileum is opened till the proximal end.



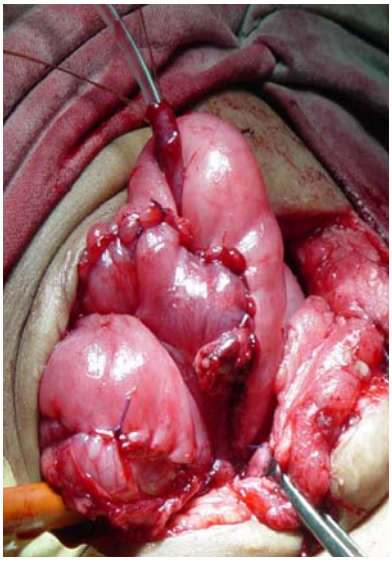
.

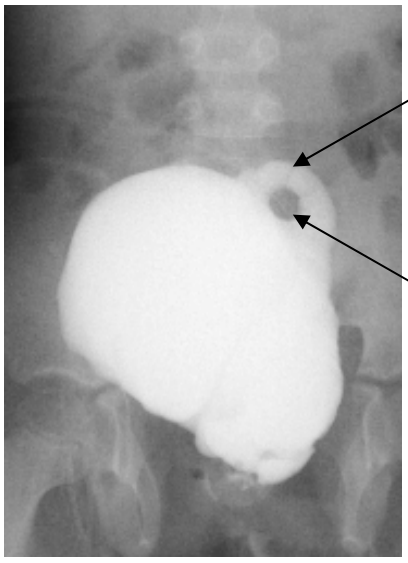
A pouch is created out of this, taking care to encircle the appendix with the un-opened ileal segment. Before completing the augment, the ureters are reimplanted into the augment such that they enter the augment after passing between the serosa of the ileum on one side and caecum on the other, at the ileo-caecal junction.





The final appearance is that of a doughnut around the insitu appendix. This unit is now patched on to the open bladder to complete the augment



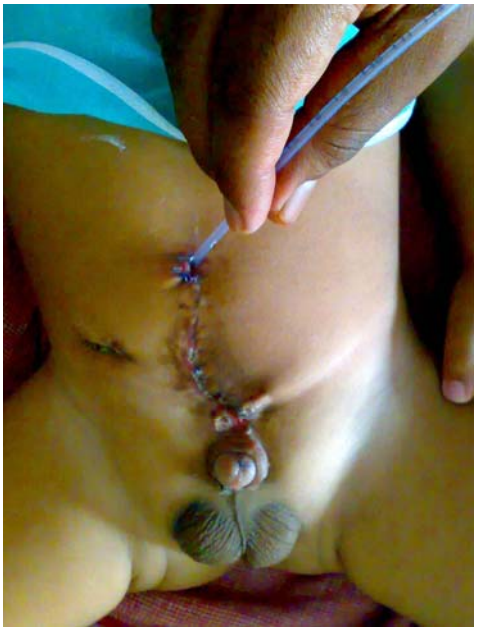


The advantage of this technique is that it solves the problem of appendix not reaching the small bladder in exstrophy patients and facilitates reimplantation into the augment

Appendix in itself has some ‘continence’ and functionally, when this augment fills up, the ileal segment surrounding the Mitrofanoff gives an additional continence to the new reservoir, Which could be tested on table, seen clinically post op and also documented in the contrast studies.

Pictures of Exstrophy epispadias repair patients

Voiding with good stream post Exstrophy Epispadias repair



Early post op repair with concomitant Augmentation and Mitrofanoff doing cic

Post Ileocaecal Bladder substitution for previous ureterosigmoidostomy patient with left non-functioning kidney due to recurrent pyelonephritis

Epispadias Repair

Abbreviations

EEC:	Exstrophy Epispadias Complex
CEB:	Classical Exstrophy Bladder
EC:	Exstrophy of the Cloaca
E:	Epispadias
YDL:	Young-Dees-Ledbetter
CPER:	Complete primary exstrophy repair
RMF:	Rectus abdominis Muscle Flap
BND:	Bladder Neck Division
HUN:	Hydro-Uretero-Nephrosis
VUR:	Vesico-Ureteric-Reflux
USG:	Ultrasonogram
MCU:	Micturating Cysto Urethrogram / Contrast Cysto Urogram
Cic:	Clean intermittent catheterisation
SPC:	Supra Pubic catheter
CMG:	Cysto-Metro Gram

1991	0	990755A	HEMALATHA'S BA	0.8 apr 2008	1		New case	primary closure without osteotomy	no hun	no hun	no vur, bulbous distal L	incont	ydl 94,modified tanago staged 94&98
1991	0	949587A	RANI'S BABY (SUDAN)		1		New case	primary closure without osteotomy incont	no usg			incont	ydl, episp repair
1992	0	061975B	PONNI'S BABY		1		New case	primary closure without osteotomy	no usg			no f/u	
1993	0	135002B	MANIKANDAN	0.7 may 2008	1		New case	primary closure without osteotomy	no hun	no hun		incont	cant-rans 96, ydl 97, incont sigmoid augm,app mitr,ydl2004
1993	0	087464B	AKASH		1		New case	primary closure without osteotomy	no usg			cont	tanago 94, penile recons 97
1994	0	172434B	LALITHA'S BABY		1		New case	primary closure without osteotomy	no f/u			no f/u	
1997	0	523471B	CHITTI'S BABY (BA	0.7 feb 2010	1		New case	primary closure without osteotomy incontinent	no hun	no hun	incr l vur	incont	mitchell repair2000,incont doughnut ileocaecal augm,app mitrof,bilat reimpl,urethral lengthning20
1997	0	473009B	NAZMA'S BABY(NA	0.7 feb 2009	1		New case	primary closure without osteotomy , incont vur	no hun	no hun		incont	ileal augm
1997	0	524306B	DHARANI'S BABY		1		New case	primary closure without osteotomy	no f/u			no f/u	
1998	0	585705B	MYTHILI'S BABY		1		New case	primary closure withoout osteotomy	no f/u			no f/u	
2000	0	839416B	LAKSHMI'S BABY		1		New case	primary closure without osteotomy	no f/u			no f/u	
2001	0	025544C	RAJAS SAHA	0.5 aug 2005	1		New case	primary clos without osteotomy,episp rep incont	no hun			incont	Bladder neck division,sigmoid augm,mitrofanof2005
2001	0	120902C	BHOLANATH NAN	0.5 may 2006	1		New case	primary closure without osteotomy incont	no hun		bilat vur pre, no mcu p	incont	Epis repair,bladder stone removal04,incont , doughnut ileocaecal augm, uret reimpl, bl, neck reco
2002	0	234535C	ADIL RAHAMAN	0.7 2009	1		New case	primary cl without osteotomy, episp rep,RMF incont b/l vur	no hun	no hun	vur resolved compl	incont	doughnut ileocaecal augm,app mitr,ydl,bilat reimpl, em-adhesiolysis 2007
2003	1	263369C	HORIPRIYA NANDI	0.5 2009	2		New case	primary clos without osteotomy, re-expl for bleeding vur, incont	no hun	no hun	resolved	incont	ydl,sigmoid augm,app mitrof2004
2004	0	444812C	YAMUNA'S BABY	0.5 aug 2005	1		New case	prim closure,l orch'pex	single k	no hun		cont	episp rep 2007
2004	1	462966C	HEMA'S BABY		1		New case	primary cl without osteotomy, episp rep	no hun			no f/u	failed repair-redo repair2005
2004	1	484158C	FIROZ KHAN		1		New case	primary clos without osteotomy,RMF mod cant-rans-episp rep,	no f/u			no f/u	
2005	0	515331C	AVOY ROY	0.5 aug 2009	1		New case	primary clos withou osteotomy,RMF incont	no hun	no hun	pre b/l gr 3	incont	doughnut ileocaecal augm, app mitr, ydl, b/l reimpl
2005	1	425492C	DEBESH PAUL	0.7 2009	1		New case	primary closure without osteotomy	no hun		small cap bl, b/l vur	incont	inj and wiring rectal prol
2005	1	574109C	SAGNIK DAS P.	0.5 2009	1		New case	primary closure without osteotomy,RMF,bilat hern,epispad vur	no hun			cont	doughnut ileocaecal augm, mitr2009
2007	1	954441C	SRILAKSHMI K.'S	0.5 jun 2009	2		New case	primary closure without osteotomy,RMF	no hun			no f/u	
2007	0	097717D	SUGANTHI'S BABY	0.4 dec 2009	2		New case	primary closure without osteotomy,RMF07 break down	no hun	no hun	rt vur		break down doughnut ileocaecal augm, bnd,app mitr09 bladder mucosal prolapse resutur
2008	4	181628D	JANSI R	0.4 sep 2008	2		New case	primary closure without osteotomy, mini YDL, L RMF	no hun			partly cont	
1993	12	920848A	EZRA		1		New case	primary closure with osteotomy incont vur	no usg	post ydl	hun, no post mitr	incont	ydl 1993, ep rep05 rec uti Mitrof 09 continent, recurrent UTI, R hun Mitrofanoff, dorsal chordee
2001	1	096386C	NAMRATA PAL	0.6 oct 2009	2	incont epispadias	New case	Rectus sling,Mitr failed perineal approach repair02	no hun		no vur	incont	revision mitroff small cap,poor compl bl 09 oxybut,amitrypt
1991	0	925071A	TERESA'S BABY(T	1.0 may 2009	1		New case	primary closure with osteotomy	hun	decrea	no mcu	incont	tanago 92, urethral divert excision03 extraperiton app mitr 05 HTn , incont ileocystoplasty
1991	0		NITHYA		2		New case	primary closure with osteotomy	hun		b/l vur	cont	bilateral reimplant
1992	0	061036A	CHITRA'S BABY		1		New case	primary closure with osteotomy	no usg			no f/u	
1994	2	186486B	BABY JAFRI		2		New case	primary closure with osteotomy vur	no hun		pre vur	incont	
1994	0	210439B	DAINY DAVID	0.8 dec 2002	1		New case	primary closure with osteotomy incont	no usg	bilat hun,	calculi	incont	ydl 97bilat ureterostomy,urethr dilatatn
1995	0	325318B	DOLI'S BABY(RAHU	0.8 jun 2007	1		New case	primary closure with osteotomy	no usg	no hun		incont	cantr-ransl rapair98, incont-ydl,doughnut ileocaecal augm,app mitr2000 episp fist
1995	7	307490B	RADHA KUMARI S	0.8 2005	2		New case	primary closure with osteotomy, urethral lenghthn(jeff)	no hun			incont	incont
1996	2	406091B	INDRAJIT LAHA		1		New case	primary closure with osteotomy	no f/u			no f/u	
1996	0	342772B	CHANDRA BHANU	0.7 jan 2009	1		New case	primary closure with osteotomy	no hun			cont	
1997	0	543914B	BIKRAM SUTRADH	0.8 2006	1		New case	primary closure with osteotomy incont	no hun	no hun	decrease vur post aug	incont	mod tanago 98,sigmoid augm-app mitr-ydl 04
1997	0	533096B	PARTHA MONDAL	0.7 feb 2010	1		New case	primary closure with osteotomy	no hun	no hun	b/l vur resolved	incont	tanago 98 small cap bl sigmoid augm, app mitr, ydl, penoplsty 2010
1997	0	308336B	NEELAMMA'S BABY		2		New case	primary closure with osteotomy	no f/u			no f/u	
1998	10	599252B	SANJAY ROUT		1		New case	primary closure with osteotomy incont	no usg			incont	epispadias repair, b/l herniotomy
1998	5	595541B	SISHUPAL DAS	0.7 jul 2006	1		New case	primary closure with osteotomy incont	no usg	no hun		incont	ydl,sigmoid augm,app mitrof, b/l hern 99, mitchel 01
1998	11	616275B	YANGCHEN		2		New case	primary closure with osteotomy	no f/u			no f/u	
1999	0	817011B	THERASA	0.7 apr 2008	2		New case	primary closure with osteotomy incont	no hun	L duple	L both moeity gr 4	incont	Bndiv, sigmoid augm app mitrof 02
1999	1	728816B	SUJATHA'S BABY	0.6 aug 2004	1		New case	primary closure with osteotomy L HUN	L hun	New R	hun	incont	ydl, sigmoid augm , bilat reimpl,double mitrof,rectus2002
2000	0	858616B	SANKAR DATTA	0.8 feb 2008	1		New case	primary cl with osteotomy imm postop resuturing, rectus flap, epispad rep	no hun	no hun	b/l resolved vur	cont	YDL,left reimpl, sigmoid augm,append mitr2005
2002	10	116178C	MANIKANDAN	0.6 apr 2004	1		New case	primary closure with osteotomy, epispadias repair	no hun		b/l vur pre, no mcu pos	incont	fistula at bladder neck with incontinence-ydl,app mitr,RMF incont sigmoid augm,app mitr05
2002	11	107933C	VIKAS	0.7 feb 2005	1		New case	sigmoid augm, app mitr, ydl , canwell-ransl2002	no hun	no hun	b/l gr3 vur		
2006	0	864735C	ASIA FATIMA	0.4 aug 2006	2		New case	Closure of exstrophy, bladder neck reconstruction, doughnut ileo caecal au	no hun				
2009	0	549037D	LOGANAYAGI,S BABY		1		New case	primary closure with bnd, doughnut ileaocaecal augment, app mitr					
2009	5	529276D	MANISH KUMAR		1		New case	primary closure without osteotomy,ydl, doughnut ileocaecal augm					
1994	1	211341B	TANUSREE DEY	0.7 apr 2010	2	incont epispadias	New case	bnp, b/lreimpl,sigmoid augm, app mitr	b/l hun	no hun	no vur post, no pre mcu		

1998	7	638912B	DIPTI KUNDU	0.8 2009	2	incont epispadias	New case	sigmoid augm	no usg	no hun	no vur			
2006	3	811030c	ANIMUL SHAQUE	0.5 apr 2009	1	incont epispadias	New case	redo closure doughnut ileocal augm,app mitrof,ydl,epispadias rep06	no hun	r hun				revision mitrof08
			BISWADIP DAS		1	incont epispadias	New case	Epispad rep, sigmoid augm, app mitr02 fistula closure fistula with scrtl flap	leak		no vur			
2002	0	229116C	DWIPANWITA PRA	0.6 jul 2007	1	st closure	failed cl, bilat vur	redo closure sigmoid augm,doubl mitrof, b/l reimpl into aug bowel, ydl, rectus fasc	b/l hun	increas	L vur	cont		unstabe bl contr, R ureteric mitr leak closure R uret mitr 04
1997	3	819359B	DEBANJAN GHOSH	0.8 nov 2005	1	st pri closure	failed closure	redo-closure with osteotomy99 incont	no hun	no hun	no VUR	incont		bn div,sigmoid augm, app mitr, Mitchell01, revision mitrof, flap cover penis 05
1999	2	816053B	FAZAL MD.	0.7 2009	1	st primary closure	failed closure	redo- closure with osteotomy, mitchell incont	no hun	no hun	no VUR	incont		ydl,sigmoid augm,app mitrof , L rectus muscle01 urethral reconstr07
2000	5	972824B	SOUMEN TALUDA	1.0 2009	1	st closure twice	failed closure	redo cl with osteotomy incont	b/l hun	resolve	hun	incont		Bndiv,sigmoid augm app n left lower uret mitrof , em adhesiolysis,01, epispa rep02, urethral sinus exc
2002	0	127573C	NAIL MOHAMED	0.6 2009	1	st closure	failed closure	redo- closure without osteotomy, epispadias repair	b/l hun	resolve	pre aug left vur, post r	incont		bn procedr multiple fistule sepsis doughnut ileocaecal augm, app mitr
2002	0	142856C	SUBHADIP SARKA	0.7 mar 2008	1	st closure	failed closure	redo- closure without osteotomy, herniotomy , incont	no hun	no hun	r resol l decr	incont		doughnut ileocaecal augm,app mitrof,ydl
2003	3	337123C	MARZANA YOUSUF		2	st closure	failed closure	redo- closure without osteotomy, bilat uret reimpl,clitor recon	no hun					
2003	0	282494C	ANURAG GHOSH		1	st closure	failed closure	redo- closure without osteotomy, rmf, episp rep,r orchidopexy left herniot	no hun					
2004	1	439907C	VENKATA SAI RAM	0.3 sep 2009	1	st repair	failed closure	redo closure sigmoid augm, ureter mitrof,bilat reimpl,episp rep incont	L hun	resolve	left gr4 vur, calculus	incont		Bladder neck plasty 09
2006	10	841949C	SANGITA ROY	0.9 aug 2007	2	st closure	failed closure	redo-closure uteropexy,app mitr, sigmoid augm	b/l hun	reduced	hun	cont		imm post op distal end mitr sloughed-revision mitr
2006	4	785049c	THAYABRAN	0.6 mar 2009	1	st closure without os	failed closure	redo closure sigmoid augm + appendicular mitrofanoff	no hun	no hun	post aug gr1 R vur	incont		
2007	0	947826C	RAJESWARI.K' BAB	0.6 mar 2010	2	st closure	failed closure	redo- closure without osteotomy,RMF,mini bl neck pl	b/l hun	R rosol	b/l gr3 vur	partly cont		
2007	3	098510D	SARAN TEJA	0.6 apr 2008	1	st closure	failed closure	redo closure,sigmoid augm, app mitr	no hun	New b/l	r gr4 vur	cont		
2007	1	094829D	DEEPIKA S	0.4 jan 2008	2	st closure-multiple ti	failed closure	redo closure duoghnut ileocaecal augm,app mitr,ydl,lt RMF,clitoroplast	no hun	expired				fistula repair07, dehiscence repair08
2009	7	491382D	ABDUL SATTAR	0.6 sep 2009	1	st closure	incont, fistulae	redo closure ydl,doughnut ileocaecal augm, app mitr,b/l ureteric reimpl into	no hun	no hun	b/l vur resolved	cont		
2005	5	643724C	UTTKASH G. BHOP	0.5 2005	1	st closure	urethro cut fist,icont	redo closure ydl,sigmoid augm,app mitr,R reimpl	no hun		pre vur	no f/u		
2003	9	404335C	SANDEEP KUMAR	0.7 sep 2004	1	st closure	urin fistulae,divert s	redo closure stone remvl,sigmoid augm,app mitr,clos fistul,	no hun	no hun	pre vur	cont		
2007	9	134798D	SURJIT PARUAI	0.6 dec 2007	1	st clos	bl neck fistula, L gr4	redo closure bl neck div,L uret reimpl,sigmoid augm,app mitr, tubularisation poste	no hun	no hun	gr4 Lvur resoled comp	cont		
2009	2	511866D	ANTARIP MAITRA		1	st closure	epispad, small cap l	episp repair incont	no hun		sm cap bladder, no vur	incont		
2009	35	527675D	HIMANSHU	1.3	1	st closure	incont, R vur	redo closure ydl, doughnut ileocaecal augm, app mitr, b/l reimpl into augm	left hun,	contr k				
2006	4	806778C	JEEVAN BAKHAT	0.5 sep 2007	1	st ileal augm	incont, vesical calcu	redo closure, ydl, sigmoid augm,app mitr, episp rep	no hun	no hun				Urethral fistula repair & glanuloplasty 2007
1995	6	287238B	BACKIYALAKSHMI	M.	2	st primary closure	incontinence	ydl	no f/u					bladder rupture - settled with drainage
1999	6	799317B	CRISTEENA	0.7 apr 2007	2	st primary closure	incontinence	redo closure bladder neck div,sigmoid augm, app mitr99	no usg	no hun				
2001			BISWAJEET		1	incont epispadias, s	incontinence	ydl partly contin, urosepsis	no f/u			partly co		sigmoid augm, b/l ureteric reimplant -- vuj obstr - revision reimpl
2001	7	963733B	AMIT DAS MODAK	0.5 apr 2004	1	st closure	incontinence	redo closure ydl,bilat reimpl,sigmoid augm, app mitr	b/l hun	resolve	hun			
2001	8	023605C	KHIDHIL	0.9 apr 2008	1	st.primary closure	incontinence	redo closure augm(R colon) bilat reimpl,app, ureteric mitr,bndiv, RMF01	no hun	no hun	bilat vur			episp rep02
2003	11	255457C	JAGANNATH DEBN	ATH	1	st closure	incontinence	redo closure neck div,sigmoid augm,app mitrof,epispad rep,L herniot	no hun					
2007	2	893322C	AJAY S	0.4 apr 2007	1	st closure	incontinence	redo closure ydl, bilat uret reimpl,doughnut ileocaecal augm,app mitr,RMF,e	no hun					augm dehisc-closure of the neobladder
2008	8	188162D	DEBANGANA MAZ	0.6 2009	2	st closure	incontinence, left du	redo closure doughnut ileocaecal augm + bladder neck division	no hun	l duplex	worsening left vur			
2008	6	018669D	TULIKA ROY	0.6 2009	2	st closure	incontinence, small	redo closure doughnut augm, b/l reimpl calculi, incont	no hun	no hun	resolved	incont		bnd, L rmf
2009	3	426750D	BALASAGAR	0.5 2009	2	sl closure	incontinence,small c	redo closure ydl, doughnut ileocaecal augm, app mitr, b/l reimpl into augm	no hun					
2006	9	934413C	MAHIN	0.6 mar 2007	1	status colonic urinar	incontinent	refashioning colonic urin cond with ileal patch, ileal monti mitrof	no usg					
1999	5	772660B	JOSEPH JOHN	0.8 may 2007	1	st.multi redo closure	incontinent epispad	redo closure neck closure,b/l reimpl,sigmoid augm,append mitr	no usg	no hun				
2003	0	070901C	SAMITH.V(nalini's l	0.6 dec 2007	1	st closure	open bl neck,episp	bl neck tightening,epispad rep03 bl stones	nohun	no hun	post reaugment decrease	b/l vu		cystolitho,ydl, sigmoid augm,app mitr,L reimpl into colon04 leak BND, Reaugment09
2007	8	076392Da	BITTU KUMAR	1.6 sep 2008	1	st closure,neck plas	small bladder	redo closure ileocaecal augm,app mitrof	b/l hun	decrea	preop gr4 b/l resolved			
2009	11	376974D	MUNNA KUMAR TI	0.7 2009	1	st closure	Small capacity bladd	redo closure sigmoid augm, bladder neck plasty + epispadias repair incont bn div	no hun	new hu	b/l vur			
1998	0	915854A	ID MOHAMMED		1	st primary closure	vur, small bladder,ir	redo closure ydl, bilat uret reimpl, sigmoid augm,mitr, neck plasty, tuu, lt reimpl, f	no usg					
2004	10	551212C	SHANMUGANATHA	0.7 may 2007	1	st closure,ydl, augm	wide neck	bl neck div	no hun	no hun	b/l vur			fistula closure, R vasectomy
2000	29	814307B	MUSTAFA.I.A	1.1 feb 2003	1	st prim closure	incont	redo closure sigmoid augm, app mitr, bilat uret reimpl, bl neck div2000	no usg	no hun				mitchell repair2002,cystolithot 03
2009	2	448305d	ATUL KRISHNA	0.4 2009	1	st closure with dj ste	incont	dj stent removal	no hun			incont		
2007	6	113807D	SURENDRA GURIA	0.7 mar 2009	1	st closure, ileal augr	bl calculus	redo closure cystolith, redo augm colon ptch, app mitr	no hun	no hun	pre b/l gr 2, no post op			
2000	14	758019B	KRISHANU CHAND	1.1 aug 2006	1	st closure twice	bl calculus, left gr 4	cystolith 99, incont	no usg	no hun	pre vur	incont		bl nec div,sigmoid augm,app mitr,l uret reimpl2000, cystolithot,epispadi repair03
1994	0	818056A	ARNAB MUKHERJE	1.1 2002	1	closure with pubic d	bladder outlet obstr	append mitroff, iliac osteotomy and tanago, urethral dilatation	no usg	no hun				glans necrosis
2007	4	990379C	LAXMI GUPTA	0.6 mar 2007	2	st closure	calculus	redo closure cystolith,doughnut ileocaec augm, app mitr	no hun,	calculus				
2009	21	154818D	GULSHAN KUMAR	0.8 209	1	st bl excision, ? Ure	L non funct kidn, bil	redo closure doughnut ileocaecal substitution,app mitrof, left nephrectomy, r	mild hun	r rosolv				
1991	0	938778A	DHEENADAYALAN	1.5 aug 2009	1	exstr-omphalo, prim	nephro,cysto lithias,	ureterostomy, cystolithotomy incont	no usg	echogenic		incont		ydl,d'nut l'cecal augm, r uret reimp, l end uret,double mitrof 1999,epispadias repair 04 bl calc cys
2001	10	020427C	PRABU M	1.3 jan 09	1	st. clos	pubic sequestr	redo closure pubic sequestr excs failed redo closure	no hun					failed closure-sigmoid augm ,neck div,doubl mitr, lt reimpl,epispad rep 2002
1991	6	785791A	BHARATHY	1.0 aug 2005	2	st ureterosigmoidos	renal calc	b/l pcn obstr changes left kidn						L-R tuu91
1998	13	320145A	RAJESH	1.6 2009	1	st ileal conduit		revision ileal conduit	mild r hun	increase hun				

continent
continent
no f/u
passing pu, dry
continent
no f/u
continent, cic
continent, cic
no f/u
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continent, cic
continent, cic
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continent, cic
continent, cic
no f/u
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continent 1/2 hr, adv augm
continent
expired
continent, cic
no f/u
continent, cic, voids pu
continent, cic
incontinent, adv augm
continent, cic
no f/u
no f/u
continent, cic
continent, cic
continent, cic
continent, cic, passed 10t
no f/u
no f/u
continent, cic, dmsa l up s
continent, cic
currently in ward post augr
continent, cic thru montl ir
continent, cic
continent, cic
continent, cic
dry, cic
no f/u
continent, cic
continent, married, retr elé
incontinent
continent, cic
continent, cic
continent, cic
continent, cic
continent, cic, back pain
continent, cic
expired RTA
cic conduit,HT

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